In This Issue *Merchandising Electrical Energy in the West together with Descriptive Details of Curr*
Happenings of Interest to Men of the Electrical Industry throughout this vast Emp

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JOURNAL OF ELECTRICITY

VOL. XXXVIII NO. 12 SAN FRANCISCO, JUNE 15, 1917 PER COPY, 25 CENTS

Hotpoint

Electric Tableware

distributed among electrically-wired homes of your community, means

- satisfied consumers, due to the High Standard of quality and perfect electrical and mechanical construction of Hotpoint Appliances.
- additional current consumption during the summer months, when light bills are low.
- substantial profit to central station, dealer and jobber.

Hotpoint Valveless Percolator (Aluminum)

A serviceable electric coffee percolator that appeals to the masses. Also made with long spout. (July 1st delivery.)

Hotpoint Valveless Percolator (6-cup—Nickeled)

Made of copper, heavily nickel plated and highly polished. Also made in 5 and 6 cup of different design.

Hotpoint Valveless Percolator (Colonial—Machine)

9-cup, of same finish as 6-cup. Used by large families; light-lunch counters and soda fountains.

Hotpoint Valveless Percolator (Grecian Urn—Machine)

A beautiful as well as useful 9-cup. Such of your custom who appreciate the *best* will seek after this appliance. Also made with panel sides.

Hotpoint Toaster

The National Breakfast Necessity. Makes delicious golden brown toast.

HOTPOINT TABLEWARE IS EASILY SOLD BECAUSE

—housewives know the superior quality of "HOTPOINT" products thru their acquaintance with the world-famed HOTPOINT IRON, of which over 2,250,000 are in use.

—of the ever-increasing popularity of "COOL-COOKING", ELECTRICALLY.

—Hotpoint National Advertising keeps Hotpoint products in the public eye consistently—NEXT HOTPOINT AD APPEARS IN THE JUNE 30th SATURDAY EVENING POST—it's a double page—two-color center spread and features "COOL COOKING" Hotpoint Tableware—Hotpoint Iron, Hotpoint Vacuum Cleaner and Ranges.

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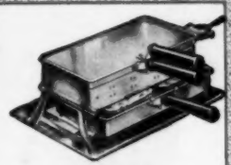
A small bake and roast oven for use on Hotpoint Radiant Grills or stove. A great favorite.



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An "Electric Table Range." Boils, broils, fries and toasts; two operations at cost of one.

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The Electric Iron that has set the Standard for 13 years—Has hot-point, cool handle, attached stand, "rest the wrist" thumb rest and easily removable hinged plug cord protector.

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JOURNAL OF ELECTRICITY

Devoted to the Generation, Distribution and Utilization of Energy

VOLUME XXXVIII SAN FRANCISCO, JUNE 15, 1917 NUMBER 12

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The Grandeur of Scenery in Western Washington, showing Mt. Rainier in the Distance

DIKING ELECTRICALLY IN THE NORTHWEST

BY R. M. BOYKIN

(Diking has become a profitable business in many submerged but fertile localities of the West. By scientific reclamation, lands have been increased in value from $2.50 per acre to $175. Such accomplishments as this may be classed as real service to the state, for productive value is thus created which did not exist before. Here is an excellent article on reclamation along the transmission lines of the North Coast Power Company that show the awakening that is going on in western Washington along these lines. The author is electrical engineer for this company and presented this paper before a recent joint meeting of the Portland Sections of N. E. L. A. and A. I. E. E.—The Editor.)

The North Coast Power Company furnishes electrical power to three reclamation projects; one near Gaston, Oregon, with 180 h.p. connected, and two at Kelso, Washington, known as Diking Districts No. 1 and No. 2, with 235 h.p. installed, or a total of 415 h.p., reclaiming approximately 5000 acres of very rich land.

The two reclamation districts near Kelso, Washington, are organized under the diking laws of the State of Washington, and they are in reality municipal corporations.

It will probably be of interest to state how these districts are formed and organized. A petition, containing the names of all the free holders, the acreage to be benefited, the boundary and the general plan of the proposed improvement, is presented to the county commissioners, signed by the owners of a majority of the acreage. This petition must be accompanied by a $500 bond to pay the expenses of the election, in case the voters turn the project down, and the bond is returned if the election is carried.

The county commissioners cause the petition to be published, fix a date for a hearing, and if at the hear-

The Former Appearance of Land now Under Productive Reclamation in Washington

The First Year's Returns, showing what Electrical Energy Can do with Worthless Lands

ing it is deemed advisable by the commissioners, they order an election held in the district to ascertain if the district shall be organized and to elect diking commissioners, who shall govern the affairs of the district.

The general election laws govern the election, and no one residing in the district for less than 30 days is allowed to vote, and if the majority of the votes cast favor the plan, the project is put through.

Three commissioners govern the project and are vested by law with considerable power. They are empowered to dike, maintain and operate their districts, can change navigable streams flowing within their area, can dig canals within and without their districts, have the power of eminent domain and can sue and be sued.

Plans are required to be filed with the officers of the superior court with estimates of the work the commissioners are to undertake; it being also necessary to show the extent of damage and benefit per acre for each property owner of the district.

Installing Transformers in the Jungle of the Reclamation District

The diking commissioners, by resolution, can cause 10 year bonds to be issued to the full estimated cost of the project. The bonds may be given in payment for contract work, but if sold must not be below par and to the highest bidder. The interest rate the bonds carry is fixed by the commissioner and the bond is a promise to pay by Diking District No. so and so, of such and such a county of the State of Washington. The bonds issued for the districts already under reclamation have proved to be in good demand.

The commission fixes the assessment on the property to pay interest and sinking fund on the bonds and for the maintenance of the dike. The county treasurer collects the assessment and acts as disbursement officer on order from the commissioners.

Diking District No. 2 contains 1300 acres of tillable land, lying between the Cowlitz and Cowemen rivers. This district was the first to dike, and when the project was almost completed the commissioners began to investigate power sources. The commissioners, with the exception of one were prejudiced against electric drive, thinking it was too expensive, unreliable and dangerous. All sources of power were investigated, including semi-Diesel engine, but each had its disadvantages, the chief being the high original cost of installation, cost of attendance and maintenance.

A long term electric power contract was finally signed by the commissioners, at the same rates mentioned in the Gaston project, with a $9 per year per h.p. connected minimum charge. The commission furnished the conductors, No. 4 copper, and hardware from the power company's substation in Kelso, one mile and a quarter to the pumping station, which is on the power line of the company.

In the pumping station are two 18 in. centrifugal single stage pumps, one belted to a 50 h.p. and the other directly connected to a 35 h.p. motor. These pumps operate against heads varying from a few inches to 15 ft., depending upon the rainfall and stages of the Columbia River. The maximum demand has been as high as 80 kw. and the first year power cost per acre of agricultural land was $1.45.

The cost of the project was $60,000 or $46 per acre of agricultural land. The dike contains 394,000 cubic yards and was placed in the dike for $.0784 per cubic yard.

Prior to diking the assessed value of the land was $2.50 per acre and it is now $45 to $160 per acre.

Diking District No. 1 was the next district to take advantage of the reclamation law in Cowlitz County. This district has 8600 acres in the water shed and 2750 acres of agricultural land.

These lands are along the Columbia River and

Map of Territory Served by the North Coast Power Company

west of Kelso in the Mount Solo and Coffin district and each day they are covered by tides and in early summer 10 to 13 feet deep with flood waters from the Columbia. It is only during August and September that the lands are dry and then can be used only for grazing.

The diking along the Columbia River is for a 30 ft. stage at Portland, which corresponds to approximately 14 ft. 40 miles below.

This district was bonded for $99,000 and the cost of the completed work was $68,000 or $24.75 per acre for the agricultural lands.

This district presented a more difficult problem for electrification than either of the two described before. The location of the belted, 24 in. centrifugal pumps, requiring 150 h.p. necessitated 6.63 miles of line. The line had to be built partly along a freshly constructed, soft, muddy dike and through the marsh tide lands.

The expense of construction and consequently heavy investment and the probability of not sufficiently long pumping periods to produce the revenue to warrant the investment, made us hesitate for some time before soliciting the business.

The run-off, rainfall, evaporation, percolation and tides had to be reckoned with to determine the amount of pumping that would be required. Using available data, it was thought $2500 to $3000 per year would be the gross revenue, which was sufficient to warrant the building to the load. As the diking progressed, however, the owners of adjacent marsh lands became much interested in reclamation and before the end of 1917 we confidently expect about 8000 acres will be placed under dike, that will be supplied with power from the same line. The calculated revenue was 59 per cent overestimated, due to a rather unexpected quantity of the drainage being taken out through automatically operated tide gates. However, with the added acreage under dike, the revenue to be derived will make the line a profitable investment.

Upon deciding to solicit the business of this district, great difficulty was encountered in obtaining it, due to the energetic work of the Semi-Diesel engine salesmen and to the lack of knowledge of the commission (composed chiefly of Finns) on electrical matters. The terms in the contract were not understood and they demurred against securing right-of-way for the line and advancing a portion of the building capital, which was to be returned in monthly payments of 30 per cent of the monthly bills, but not to apply upon the minimum charge.

Fortune smiled upon us in the survey which was done when the country was frozen early in 1916, otherwise the cost would have been high, on account of the soft boggy ground. The cost of the survey and detailed maps and plans of the line was $28.50 per mile. When the preliminary estimate of the cost of building the line was made, it was decided to use No. 6 M.H.B. copper, the price then being 20c per lb. By the time orders were to be placed for the material, copper had advanced to 27c and No. 6 could not be had.

The pole spacing is now 300 ft. with one-fourth inch, 7 strand, No. 14 double galvanized, low strength steel for conductors, and No. 9 B.B. telephone wire for ties. The line is designed to carry 225 kw. with 5 per cent drop at 22,500 volts, but later the voltage will be doubled and the line extended some 8 miles for another load of somewhat the same character, down the river.

An Outdoor Transformer Station with Dikes in the Distance

The highest load on this steel conductor line has been 135 kw. but will be 270 kw. when the added acreage is enclosed by the dike, at which time tests will be made to determine the voltage drops and power lost. The conductors have 48 in. of sag at 70 degrees temperature, giving ample factor of safety for the climatic conditions on the Columbia River so near the mouth.

CONSTRUCTION FEATURES OF TWIN PEAKS TUNNEL

BY R. C. HACKLEY

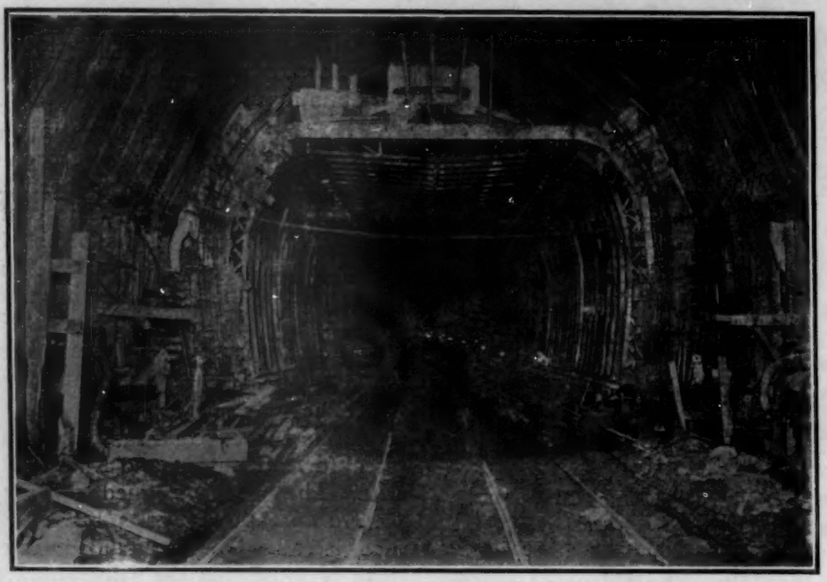
(Thirty-seven hundred feet is a new record for shooting concrete through a cement gun. Below is a remarkable account of how concrete has been efficiently handled through such a record breaking distance in which velocities of a mile a minute have been experienced. The Twin Peaks Tunnel for the municipal railways in San Francisco has other unusually interesting features in its construction, especially in the manner in which the giant steel forms for concreting have been utilized. The author is the superintendent and engineer for the construction company by whom this work is being performed.—The editor.)

The Twin Peaks Tunnel, now nearing completion in San Francisco, is the largest municipally owned electric street railway tunnel in the country, being twelve thousand feet in length, and twenty-five feet in width, allowing ample room for two tracks.

In section, the tunnel is horseshoe shaped with a reinforced concrete slab or ceiling across the tunnel four and one-half feet below the arch. This space is provided for the ventilation of the tunnel by forced draft. During the construction this space has been used advantageously for the purpose of ventilation, carrying of temporary wiring, and for the transportation of concrete.

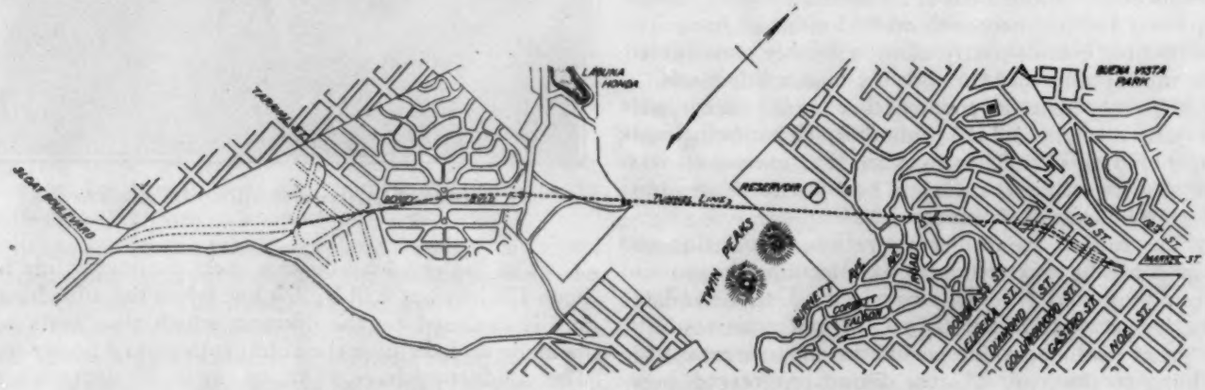
Two features of the construction work which are out of the ordinary, and which have worked out very successfully, have been the use of a specially designed steel concrete form, and the use of compressed air for the mixing and transporting of all of the concrete throughout the tunnel proper, amounting to approximately seventy-five thousand cubic yards.

The placing of the concrete lining follows as closely as is practical the excavation and is carried along in three distinct operations. First, eighty feet of steel forms are set for the footings of the side walls of the tunnel, and the concrete poured by means of chutes from a hopper hereafter described. Then after this concrete has set sufficiently or for about forty-eight hours, the forms are removed and the steel form for the side walls and ceiling slab are moved ahead in ten foot sections and secured to the concrete footings by bolts previously set in the soft concrete. The form sections which weigh seven and one-half tons each are carried on a timber traveler running on rails which are clear of the double tracks used for handling the muck from the heading. As the traveler is built so

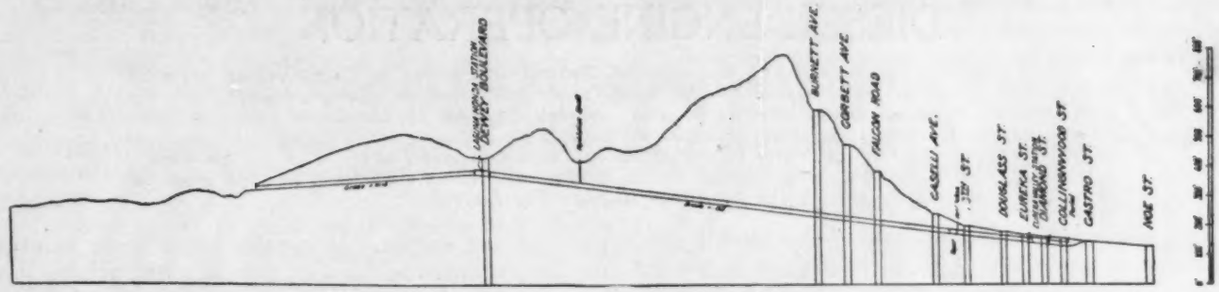


Interior View of Twin Peaks Tunnel, looking West

Here are shown the giant steel forms in place, the pumps for handling the water encountered, the baffle above for meeting cement gun velocities of a mile a minute and in the center the traveling frame work for manipulating the steel forms upon tracks at the extreme sides of the tunnel. This tunnel, twelve thousand feet in length, is the largest municipally owned electric street railway tunnel in the United States. On the extreme sides may be seen the conduits for the electrification of the railway workings which are soon to be installed.



Plan, showing Interconnection of Districts Served by Tunnel



Profile of Tunnel, showing Various Stations

that the dirt cars from the heading can pass under it, all construction operations can be carried on at the same time without interfering with one another. The traveler is pulled ahead on its track by means of a hoisting engine, operated by air, mounted on the traveler, pulling on a line lead out ahead. In this manner the eight forms or eighty feet comprising the set are moved ahead in about ten hours by a crew of four men. The forms are so designed that one can be passed through another if so desired by lowering it down and swinging the sides in. After the concrete sides and slab are poured the eighty feet of arch is framed and poured. In this manner eighty feet of concrete lining is poured every week.

The concreting is carried on from both ends of the tunnel, the air for all operations being compressed at one central power station. This plant consists of two seven hundred and fifty cubic feet and one eleven hundred feet two-stage compressors run by two 100 h.p. motors, and one 150 h.p. respectively. The air is compressed to about 100 pounds, and is carried over a hill to the east end, a distance of seven thousand feet, in a six-inch pipe, where it enters a receiver. From this receiver, the air is lead in a four-inch pipe to the mixer, located under ground, which is a steel drum about thirty-six inches in diameter and five feet long standing on end with a conical bottom terminating in a specially constructed eight-inch elbow, to which is connected the eight-inch discharge pipe. The mixer is charged from material bunkers above, the aggregate being measured in a charging hopper directly over the mixer. When the dry batch is ready in the hopper a door in the top of the receiver or mixer is opened, the charge dropping in, and at the same time a measured quantity of water is also run in. The charging door is now closed by a piston operated by air, and at the same time a valve is opened, admitting compressed air to enter at the back of the elbow at the bottom of the mixer through a two-inch pipe. Immediately on opening the lower valve, another vale is opened allowing the air to enter at the top of the receiver or mixer and putting a pressure directly behind the batch and thus forcing it out at the bottom where the lower jet keeps it moving. The batch of concrete will usually travel through the eight-inch pipe in a mass, at the rate of about a mile a minute and to receive this blow, a steel hopper is secured to the tunnel timber at the discharge end of the pipe, the concrete striking against heavy renewable steel plates. The speed of operation of the gun depends upon the length of pipe line and will vary from seventy batches per hour at three hundred feet, to thirty batches at the present distance, which is the record for the pneumatic gun, being 3700 ft. The efficiency of the gun is dependent on the operator and the volume and pressure of air available. A careless operator may cause a plug in the pipe line, taking hours to clear. The concrete from the east end being forced up a 3 per cent grade is necessarily raised a height of 111 feet, and uses a large quantity of air. From the steel box or hopper at the end of the pipe the concrete is carried to place in the footing walls and slab by gravity and worked into place as ordinary concrete. In the case of the arch which is eighteen to twenty-two inches in thickness the concrete is shot directly into place, lengths of pipe being removed from the end of the line as the space is filled with concrete.

At the present time, there remains about three hundred feet of the rock core to be taken out, and seven hundred feet of concrete lining to be completed. By the first of July, the tunnel will be entirely completed.

The entire construction work has been handled by the contracting firm of R. C. Storrie & Company under the supervision of M. M. O'Shaughnessy, city engineer of San Francisco.

KEEP THE PUMPS WORKING

Owners of irrigation pumping-plants throughout California are in a position to add greatly to the production of food supplies for the Allies by selling water to their neighbors at a reasonable cost during such times as their pumps are not needed for their own irrigation.

This is the conclusion of the College of Agriculture of the University of California, after a thorough survey of the irrigation resources of the state.

Few irrigation pumping-plants in California are now run continuously. A very large majority of them are not operated at night.

An emergency law just passed by the legislature permits individuals to dispose of water without becoming public utilities and without incurring an obligation to continue to supply water in the future.

The Committee on Resources and Food Supply of the State Council of Defense urges owners of land near pumping plants to make every effort to obtain water from such plants when they are not needed by their owners. Also, it urges owners of such pumping plants, to make the charges to their neighbors as low as possible, in order to stimulate the continuous use of pumping plants throughout the irrigation season during the war period.

DIESEL ENGINE OPERATION

(Here is an excellent discussion of how some of the serious troubles in Diesel engine operation may be done away with. The deposit of scale in the water jacket and the accomplishment of effective lubrication are factors that have much to do with efficient operation of the Diesel Engine. These factors are among several important questions discussed in the following article. This article has been written for the Journal of Electricity by one of the best known engineers in the West, but his name is withheld by personal request. It is believed that its contents will receive an unusual welcome by all interested in increasing the efficiency of the Diesel Engine.—The Editor.)

Engineers who have recently given careful consideration to Diesel engines are convinced that with proper precautions and with a thorough understanding of operating conditions the Diesel engine, as manufactured in the United States, is unequalled for certain classes of service, but nevertheless operating troubles seem to increase rather than decrease with the number of installations, and many engineers have been discouraged from adopting them because of the apparent failure of some installations.

A few suggestions as to how some of the more common but serious troubles may be obviated are offered:

Too frequently does the user overlook the fact that the maximum horsepower developed by the Diesel engine depends not upon the amount of fuel oil introduced into the cylinder, but upon the amount of oxygen present to burn the oil.

The maximum horsepower output of an engine is proportional to the displacement air capacity of the cylinders. The lower density of the air and higher altitude is responsible for the decrease in horsepower output of Diesel engines as compared with the sea level rating. At sea level an engine should be rated on a basis of cylinder capacity of air per brake horsepower per minute. There is a tendency among American manufacturers to apparently over-rate their engines. This is shown by the cylinder capacity per brake horsepower per minute of different makers, which varies from 2.92 to 3.54. It is the air capacity and not the fuel consumption that determines the maximum continuous horsepower output of a Diesel engine.

Another point almost always ignored is the decreasing output and hazardous condition of operation resulting from a deposit of scale in the water jacket. Manufacturers recommend that their engines be operated with cooling water issuing at a temperature not to exceed 130° F., and provide thermometers for determining the temperature of the cooling water issuing from the engine. As the outside or jacket surface of a cylinder liner is at a much higher temperature than 130°, this temperature only indicates the average temperature of the water in the cooling jacket, and it is obvious that the water in immediate contact with the cylinder liner is at a very much higher temperature. Most waters, under these conditions, deposit a scale which gradually becomes thicker until it forms a fairly good insulating coating on the surfaces, which require the greatest cooling. Eventually the condition is arrived at where insufficient cooling is obtained although the thermometer may show and often does a gradual reduction of temperature of cooling water and cylinder and valve troubles develop. These difficulties are usually preceded by excessive carbonization, inability of the engine to deliver full load, and frequenly a seizing of the piston in the cylinder and the breaking of major parts of the engine. It usually takes some months for this condition to develop, and the manufacturer has been paid in full and departed joyfully, leaving the trouble that follows to the purchaser and his operating engineer.

This trouble is avoided by some operators who at intervals of two or three months dissolve the scale by the introduction of a weak solution of hydrochloric acid, followed by a thorough cleaning and washing of the internal surfaces of the water jacket. This treatment if properly used at regular intervals, depending upon the amount of scale forming qualities of the cooling water, will usually avoid troubles resulting from over-heating due to the cooling water not being able to properly perform its function of cooling the cylinder walls. Another method, however, has been used in a recently installed plant, in which distilled circulating water is used for cooling the cylinder jackets, the distilled water being pumped through pipe coils and forming with an expansion chamber practically a closed system, requiring little or no additions or make-up water. The pipe coils are located outside of the building and the distilled water circulating within them is cooled by dripping over them a sufficient quantity of cold water, regardless of its clearness or scale forming qualities.

Unsatisfactory and defective lubrication is responsible for many of the Diesel engine operating troubles. In many makes of engines the lubrication of the wrist pin is particularly inefficient, requiring the use of a large quantity of oil, of which but a small quantity ever reaches the bearing surfaces of the wrist pin, the balance finding its way into the lubrication of the piston. The excess in combination with excessive heat conditions due either to overload or scale eventually becomes carbonized and fills the grooves of the cylinder rings making them ineffective. An excess of lubricating oil between the piston and the cylinder is sure to carbonize, requiring the frequent pulling of pistons and cleaning of ring grooves and rings. Proper and efficient lubrication equipment that will put the required quantity of oil where it is needed instead of using a flood of oil in the hope that a small quantity will find its way into a bearing is to be greatly desired, particularly for the wrist pins of Diesel engines.

A new Pacific Coast construction record is claimed for the huge Southern Pacific building which is already transforming the appearance of lower Market street. Ground was broken for this—the largest office structure in the West—September 1, 1916. With the first of May, 1917, the structure was approximately seventy per cent completed, with every prospect that the general contractors will turn over the building for occupancy one year after the first shovelful of dirt was removed.

CHEMICAL WEALTH IN LAKE WATERS

BY J W. BECKMAN

The most noted example of an inland sea in the United States containing in its waters chemicals of value is the Great Salt Lake in Utah. This lake contains practically the same salts as occur in the waters of the ocean, only at a much higher degree of concentration.

Further west, in the states of Oregon and California, there are a number of lakes of various sizes, containing waters in some cases heavily charged with valuable salts readily recoverable. Especially noticeable among these are the Searles Lake, in the lower part of California, Owens Lake and Mono Lake, in the eastern part of the State of California. These lake waters contain considerable quantities of soda ash, which is used in the households, as well as industries. The borax content of these waters is also considerable and offers a readily available source for this salt. Some potash is recovered, and a great quantity of common table salt is also obtainable from these lake waters.

The origin of these salts is in many cases hard to trace. In some cases they are undoubtedly due to an arm of the ocean becoming land-locked and the water gradually evaporating, producing concentrated salt solutions; but since in some there are present salts which do not occur in the ocean waters, it has to be assumed that these salts have been leached out from the surroundings—in most cases high mountain ranges.

The war, with its accompanying high prices for chemicals, has brought these lake waters to the attention of various interests; and plants are already established, and are being established, on the edges of these lakes, where, through solar evaporation, as well as artificially, various salts are separated from each other and obtained in marketable condition.

A remarkable incident with those waters is the fact that they seem to be continuously fed from subterranean sources, since they maintain practically a uniform concentration of salt solutions. The natural evaporation, which takes place from the surface of the lakes during the hot, dry, summer season, does not seem to materially vary the salt percentage in the lake waters.

The waters of these lakes belong to the people of the United States and whoever places a pipe line to the edge of the water and pumps the water out of them has the right to the salt contents of same, without further cost.

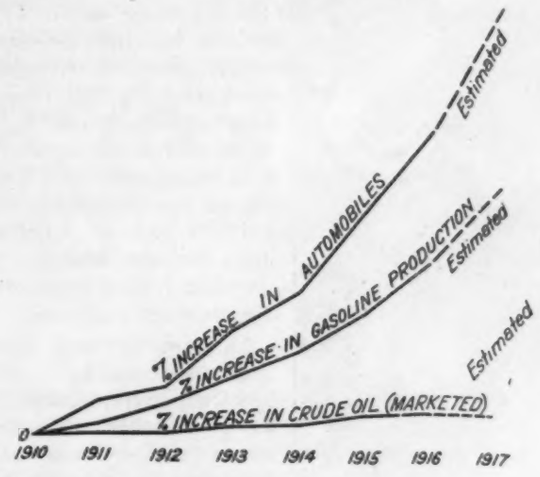
GLASSES FOR PROTECTING THE EYES FROM INJURIOUS RADIATIONS

A new publication of the Bureau of Standards (Technologic Paper No. 93) entitled "Glasses for Protecting the Eyes from Injurious Radiations," has made its appearance and will be found extremely useful.

The object of the present investigation is to give the protective characteristics of representative groups of glasses which are available for protecting the eye from (1) the ultra-violet, (2) the visible, and (3) the infra-red rays. The paper gives the characteristics of black, amber, green, greenish-yellow and red glasses which are efficient in protecting the eye from the ultra-violet rays. Similarly the characteristics of deep black, yellowish-green, sage green, gold plated and bluish-green glasses are described, which are efficient in protecting the eye from the infra-red rays.

A GRAPHIC CHART DETAILING THE FUEL OIL SITUATION

In a recent address on the petroleum and gasoline situation delivered by Van. H. Manning, Director of the U. S. Bureau of Mines before the editorial conference of the business publishers association in Washington, D. C., the chart reproduced herewith was exhibited. The graphic chart shows the percentage of increase in the number of automobiles and the percentage of increase in the production of gasoline and crude petroleum since the year 1910. The lack of parallelism of these curves indicates what may be expected in the future, especially in the motor fuel market and illustrates the general situation perhaps better than any mass of figures that may be compiled.



MEASURING THE VOLUME OF CALIFORNIA STREAMS

The study of the volume of flow of the principal rivers of the United States is one of the important activities of the United States Geological Survey, Department of the Interior. A report that will be useful to engineers and others interested in the utilization of the streams tributary to the Pacific Ocean in California has just been issued by the United States Geological Survey as Water-Supply Paper 361, which is one of a series of twelve reports presenting the results of measurements of flow of the streams of the United States made during 1913.

The German howitzers which so speedily demolished the Belgian and French fortresses are reliably reported to have been made with linings of molybdenum steel, which not only withstands better than any other steel the enormous stresses of modern high explosives, but owing to its high melting point is less affected by the heat of the gases released and thus provides an ordinance far longer lived than that made of any other steel. Here is another opportunity for investigation of Western resources and possible electrical applications.

PHOTOGRAPHY FOR THE ENGINEER

(Interior photography, especially where machinery is involved, is a subject of much confusion to the engineer, who is often anxious to preserve in his files a view of an interesting installation visited by himself. Here are terse rules that should be of immense value for handy reference, when such views are desired. The author is on the engineering staff of the Pacific Gas and Electric Company in San Francisco. In our next issue, a discussion of night photography will conclude this series of four articles, which have proved so helpful to engineers in their use of the camera.—The Editor.)

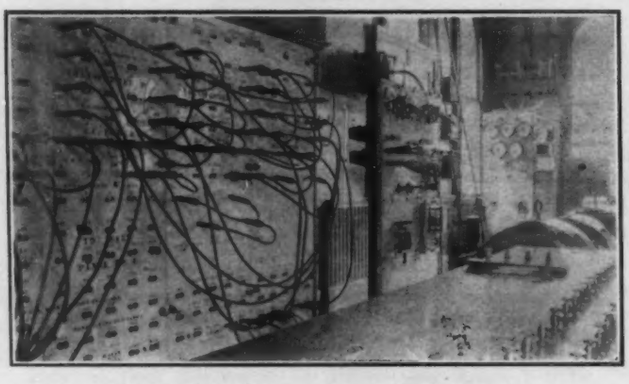
INTERIOR PHOTOGRAPHY

BY C. B. MERRICK

An Interior View of a Power Plant, Skylighted, Bright Outside, No. 16 Shutter, Eight Seconds

SPECIAL subjects often require special exposures to produce correct results. The engineer is called upon to take interior views of construction or repair work and for that reason these will be dwelt upon in detail. Here the variation in intensity of illumination is especially great. Due to lack of reflected light and the nearness of the object, long exposures are required.

Medium colored walls and surroundings will lengthen an exposure to double that necessary where white walls predominate, while dark walls require four times as much time. A skylighted room will require less time than one with windows, due to the reflected light of the sky, while a room with only one window requires approximately twice the exposure where more windows are at hand.



A Window Lighted Laboratory at Four O'Clock on a Cloudy Day, No. 4 Shutter, Thirty Seconds

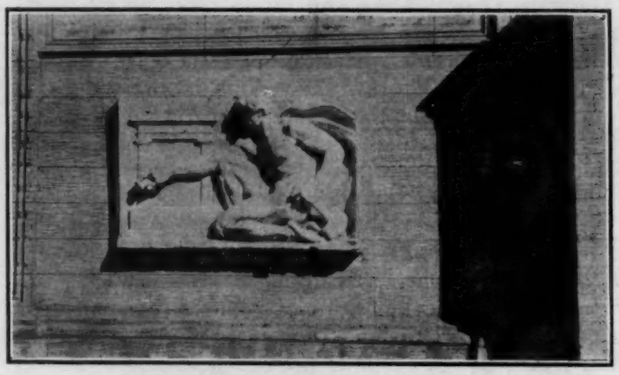
If important to obtain the picture without delay, a good rule to follow is to make one exposure at the estimated value and then take two others, giving respectively 1/3 and 3 times this value.

Rules for Inside Work

1. Main light—for relief.
2. Auxiliary light—to prevent lack of detail in shadows.
3. Curtain windows in field of view to guard against over-exposure.
4. Avoid reflections in glass or shiny surfaces.

Suggestions for General Use

1. Take contrasty views on cloudy days.
2. Intensify flat views by use of shadows.
3. Shadows are long, early and late.
4. Take snow scenes toward the sun, but shield lens from direct light.
5. Don't take pictures when hazy or dusty; and keep the lens clean.
6. Sunshine on leaves makes a spotty background.
7. Focus accurately for close views.
8. Carry camera set at stop 16, 1/25 sec., as this is value most often used.



"The Builder" at the San Francisco Exposition Intensified by Shadow, No. 30 Shutter, One Twenty-fifth Second

WAR LOANS

Great Britain's estimated wealth is $85,000,000,000; she has made three great loans since the commencement of the war, aggregating $10,000,000,000. Her last loan was for $487,000,000, which was the greatest single loan ever floated in the history of the world. It was taken up in 30 days, 5,289,000 individuals subscribing to the loan. One person in every 11 inhabitants of the United Kingdom subscribed to this loan, and the average subscription was $950, though a great many subscribers took only £1 or about $5. The great number of subscribers to this loan is pointed out as evidence of the patriotism of the British people. Germany's wealth is estimated at $80,000,000,000. Germany has put out five loans since the commencement of the war, aggregating $11,750,000,000. In Germany's latest loan 1 person in 13 of the population is reported to have subscribed, and the average amount taken by each subscriber was $700.

Taking into consideration these figures, the $5,000,000,000 loan of the United States with an estimated wealth of $220,000,000,000 and a population of over 100,000,000 seems almost small. With a wealth nearly three times as great as that of Great Britain it is trying to borrow less than one-half of what Great Britain has borrowed. With a population one and one-half times as large as that of Germany our loan is much less than half of the amount that Germany has borrowed.

America's Liberty Loan is less than one-sixth of the bank deposits in our country. An ordinary borrower does not think he is ruining himself when he borrows 40 per cent of the value of his property. The United States is borrowing less than 3 per cent of its wealth.

STANDARDIZATION OF TRANSFORMERS

BY S. J. LISBERGER

(All engineers engaged in the design and operation of distribution systems know well the troubles encountered in endeavoring to purchase and operate transformers for different ratios for approximately the same voltage. There existed twelve different classes where normally there should have been but three and this refers to only one division of the transformer supply and not to the entire line so that after all there existed very many classes where there should have been but few. Here is a report on transformer standardization of vital interest to engineers throughout the West. The writer is a member of the Committee on Electrical Apparatus, N. E. L. A., and as such was appointed chairman of the Western Sub-Section of the National Committee to deal particularly with the subject of the standardization of transformers. It is to be particularly noted that this report is not a verbatim copy of the National report but is rather a paraphrased edition by the writer to cover all essentials for Pacific Coast conditions.—The Editor.)

For several years the Apparatus Committee of the National Electric Light Association has been endeavoring to standardize the sizes and voltages of the several lines of transformers.

At the beginning of this work, in one line of distribution transformers alone, twelve separate and distinct ratings existed, where there should have been normally but three.

This condition did not tend to bring about a reduction in transformer costs, nor an improvement in stock conditions.

It was in the hope of remedying these conditions that the apparatus committee undertook the work of bringing about a common standard.

In order that there might be representation from the West the apparatus committee appointed in 1916 a Western sub-committee to deal with this problem of standardization and following a meeting of the Western sub-committee, together with the power companies in this section, a representative was sent east to attend the meeting of the apparatus committee in February.

At this meeting the whole problem was very frankly and thoroughly discussed and as a result the following standards have been prepared after carefully analyzing the requirements of the large majority of the transformer users.

It should be borne in mind that there are many systems whose transformer requirements will not conform to the standards listed and it is not the intention that these recommendations shall limit the use of any special transformers, but the specifications herein are the ideal towards which to work in designing new systems or in making additions or changes in existing systems.

Material economies will result to users of this class of apparatus if these standards are generally adopted, deliveries will be improved and local stock conditions will be much better than under existing conditions.

Transformers are classified as power transformers Class "A," used as step up units in generating stations which includes sizes **above 200 k.v.a.** In the second class are substation transformers Class "B" which includes primarily those transformers in sizes above 200 k.v.a. These are used to step down from the transmission voltage to a distribution voltage; and also includes transformers in sizes **above 200 k.v.a.** used to step down from either the transmission or distribution voltage to service voltage suitable for supplying various current consuming deviees.

As a third class, we have distribution transformers Class "C." This class includes primarily those transformers in sizes of **200 k.v.a. and below** which are used to step down from the distribution voltage to a service voltage suitable for supplying various current consuming devices; and also includes transformers in sizes 200 k.v.a. and below used to step down from the transmission voltage to a service voltage or even from the transmission voltage to a distribution voltage.

Specific Standards for Power Transformers—Classes "A" and "B"

Standard types—Oil immersed—self-cooled; oil immersed—water cooled; air blast.

Standard frequencies—60 cycles per second; 25 cycles per second.

Standard k.v.a. sizes.

The trend of practice has shown that in the adoption of transformer sizes it is best to consider the three-phase or bank capacity of the installation rather than the capacity of single-phase units. Therefore, in this list of standards the size of the three-phase and single-phase units comprising the bank are on this basis.

In selecting the size of a bank of transformers the present connected load, the estimated additional load and the load factor are usually given proper consideration. As some of these factors can at best be only approximated it is strongly recommended that the standards listed be followed.

It is believed that material benefit will accrue to operating companies if logical standard sizes are adopted, and it is hoped that all operating companies will encourage the manufacture in line with the standards.

Standard k.v.a. Sizes—Power Transformers

Oil Immersed Self Cooled		Oil Immersed Water Cooled and Air Blast	
Single Phase	Three Phase	Single Phase	Three Phase
...	300	...	...
...	450	...	...
...	600	...	...
250	750	...	750
333	1000	...	1000
400	1200	...	1200
500	1500	500	1500
667	2000	667	2000
833	2500	833	2500
1000	3000	1000	3000
1250	3750	1250	3750
1667	5000	1667	5000
2000	6000	2000	6000
2500	7500	2500	7500
3333	10000	3333	10000
5000	15000	5000	15000

Standard High Voltage.—The following nominal open circuit high voltage values are recommended as a standard for power transformers.

Single-phase transformers for 3-phase operation at these voltages will be rated in accordance with the connection used.

For example: 6650/11500 "Y" if for "Y" connection, or 11500 if for delta connection on 11500 volt line.

Standard High Voltages—Power Transformers—Classes A & B

Oil Immersed Self Cooled Also Oil Immersed Water Cooled	Air Blast
2300	2300
6900	6900
11500	11500
13800	13800
16500	16500
22000	22000
33000	.....
44000	.....
66000	.....
88000	.....
110000	.....
150000	.....

It is recommended that the application of air blast transformers be confined to systems where the line voltage does not exceed 25000.

Standard Low Voltage.—230/460 volt for nominal 220 and 440 volt motor service.

575 for nominal 550 volt motor service.

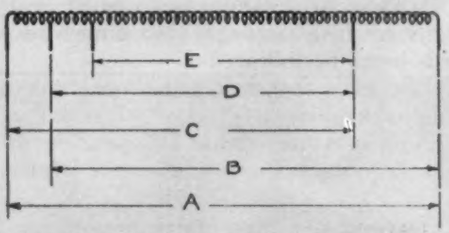
2300/4000 "Y" for nominal 2300 volts single-phase and 3-phase delta; also for 4000 volt, 3-phase "Y" either 3 or 4 wire.

Note.—When voltages in excess of 2300/4000 "Y" are required it is recommended that they agree with the standard high voltages listed above.

Series multiple connection on low voltage side of power transformers involving more than two voltages should be avoided.

Standard Taps.—Power transformers used in both generating and substations may in many cases require taps to compensate for transformer and line drop.

As transformers with taps are more difficult to construct than those without due largely to the problems connected with insulating the tap connections, it is recommended that purchasers of transformers limit the number of taps to the lowest possible minimum,



Method of Obtaining Four 2½ Per Cent Voltage Steps
A = 100%. B = 97½%. C = 95%. D = 92½%. E = 90%.

obtaining thereby transformers with safer operating characteristics and at lower cost. When taps on power transformers are necessary it is recommended that they be limited to two 5 per cent steps, or at the most four 2½ per cent voltage steps below normal rated voltage.

Specific Standards for Distribution Transformers, Class "C"

Inasmuch as this class of transformers covers those of 200 k.v.a and below the oil immersed self cooled type is standard for this class.

Standard Frequencies.—60 cycles per second; 25 cycles per second.

Standard k.v.a. Sizes.—In the following table are listed the sizes of single-phase transformers which have been adopted as standard.

Standard High and Low Voltages.—In preference to manufacturing two lines of transformers heretofore

Standard Single-Phase Sizes for the Different Voltage Lines of Distribution Transformers

k.v.a.	Sizes							
1	2300		11500*	.....	.....	.....	.....	.....
1.5	....	6900	.....	.....	.....	.....	.....	.....
2	2300	....	.....	.....	.....	.....	.....	.....
2.5	....	....	11500	13800	.....	.....	.....	.....
3	2300	6900	.....	.....	.....	.....	.....	.....
5	2300	6900	11500	13800	16500	22000	.....	.....
7.5	2300	6900	.....	.....	.....	.....	.....	.....
10	2300	6900	11500	13800	16500	22000	33000	.....
15	2300	6900	11500	13800	16500	22000	33000	44000
25	2300	6900	11500	13800	16500	22000	33000	44000
37.5	2300	6900	11500	13800	16500	22000	33000	44000
50	2300	6900	11500	13800	16500	22000	33000	44000
75	2300	6900	11500	13800	16500	22000	33000	44000
100	2300	6900	11500	13800	16500	22000	33000	44000
125	2300	6900	11500	13800	16500	22000	33000	44000
150	2300	6900	11500	13800	16500	22000	33000	44000
200	2300	6900	11500	13800	16500	22000	33000	44000

Note:—As a very large proportion of distribution transformers in sizes of 200 k.v.a. and less are used as single-phase units your committee has not attempted to recognize standard sizes for three-phase distributing transformers although it will probably be able to do so at a later date.

* This transformer has no taps.

rated 2400 to 120/240 and 2200 to 110/220, one line will be now manufactured instead of these two.

The new transformer replacing the others is to be triple rated, having a primary winding nominally designed for 2300 volts with a ratio of 20 to 1; this transformer can be operated at full rated capacity at any one of the following voltages with the same ratio:

2400 to 120/240 or 240/480.
2300 to 115/230 or 230/460.
2200 to 110/220 to 220/440.

The existing lines of 6600 volt transformers had different percentage taps on the primary and different ratios between primary and secondary. The majority of this type of transformer in use had a primary of 6600 with taps 6300/6000/5700, the secondary being 110/220/440.

As motor voltages had been standardized at 220 and 440 volts, and as the lines on which these transformers were operated covered a very wide area, and furthermore, as the load was of a seasonal character which does not justify the size of wire that would normally be used in congested city work, it was found necessary to work the transformer at over-voltage in order to deliver a sufficiently high secondary voltage at the motor.

This practice showed that the ratio of the transformer would have been better suited to Western conditions if the secondary had been 115 instead of 110 volts. To change this ratio would complicate operation, particularly on the coast where over 25,000 kilowatts of this style is now in use.

It was recognized that the future design of this class of transformer should meet the new condition which is tending towards raising both primary and secondary voltages and at the same time should maintain the existing ratio of the present class in order that the transformers would bank properly.

To meet these conditions it was decided that the old 6600 volt class should be redesigned; the new class to have a triple rating similar to the 2300 volt class and that the taps be based on 6600 volt operation in order to bank with the old transformers. The new transformer is to be known as the 6900 volt line and rated as follows:

7200 to 120/240 or 240/480.
6900 to 115/230 or 230/460.
6600 to 110/220 or 220/440.

The 11000 and the 13200 volt transformers have been similarly triple rated, the new class to be known as 11500 volts and 13800 volts.

The following voltages are recommended as desirable for distribution transformers:

High and Low Voltages—Distribution Transforcers

High Voltage		Low Voltage (Open Circuit)
2200	to	110/220 or 220/440
2300	**to**	**115/230 or 230/460**
2400	to	120/240 or 240/480
2200	to	575
2300	**to**	**601**
2400	to	627
6600	to	110/220 or 220/440
6900	**to**	**115/230 or 230/460**
7200	to	120/240 or 240/480
11000	to	110/220 or 220/440
11500	**to**	**115/230 or 230/460**
12000	to	120/240 or 240/480
13200	to	110/220 or 220/440
13800	**to**	**115/230 or 230/460**
14400	to	120/240 or 240/480
16500	**to**	**115/230 or 230/460**
22000	**to**	**115/230 or 230/460**
33000	**to**	**115/230 or 230/460**
44000	**to**	**115/230 or 230/460**

Note:—The voltage rating listed in bold type are considered the normal voltage ratings of these transformers and guarantees will only be made on the basis of these normal ratings. It is understood however that the transformers having triple voltage ratings will operate satisfactorily at any of the voltage ratings indicated as applying to that line. Name plates will indicate the triple voltage rating for the first group listed in the above table, but the name plates for all other lines will indicate only the normal rating, including taps. In all cases where a transformer has more than one voltage rating a paster will be placed inside the transformer cover showing the voltage ratings at which the transformer may be used in addition to the normal rating appearing on the name plate.

Several large systems now use transformers with a 115/230 volt secondary, having a 9 to 1 ratio. These systems find it impracticable to change to a 10 to 1 ratio on account of the size of the system and the number of transformers involved. This line of transformers will therefore continue to be made but in new developments it is recommended that the standards shown in the above tables be adopted.

It has been the practice of operating companies on the Pacific Coast to specify a three-voltage secondary rating on the 6900 volt line of transformers. In discussion at the New York conference the manufacturers showed that a cheaper and better transformer could be produced by adopting the two voltage combination (115-230 or 230-460) instead of the three voltage (115/230/460) and that the operating companies could save money by using a low voltage transformer or compensator stepping from 460 to 115 volts wherever it is necessary to deliver 115 volts from the same bank supplying 460 volts; this compensator or transformer would be cheaper than to incur the extra expense of having every transformer produced with a three-winding secondary as only a very few installations of the total made would utilize the 115 volt connection when 460 volts were supplied.

Series multiple connections with more than one combination in the low voltage winding of distribution transformers are particularly undesirable from the standpoint of best transformer design and construction should be confined to such combinations as 115/230 or 230/460 and not 115/230/460.

Taps.—Taps on transformers of voltages below 6900 should not be necessary in good Central Station practice, as potential regulators are generally used to compensate for voltage regulation.

Transformers designed for 6900 and 11500 volts are generally used on systems covering a wide territory and under conditions usually requiring tap connections to deliver the proper voltage at the consumer's service.

The following taps in the high voltage windings are recommended on the 6900 volt line.

5700/6000/6300 based on 6600 to 110/220 or 220/440 volt operation.

5960/6275/6585 based on 6900 to 115/230 or 230/460 volt operation.

6220/6545/6875 based on 7200 to 120/240 or 240/480 volt operation.

Where taps are necessary on transformers 11500 volts and above they should be confined to 2-5 per cent taps.

It is recommended that no taps be specified in the low voltage windings of Class "C" transformers.

It should be noted for the special benefit of those companies using 3-phase transformers that taps in this line of transformers multiply the complications by three as compared with single-phase units. Taps in this line should therefore be avoided where possible.

Transformer Impedance.—The question of standardization of impedance of distribution transformers was generally discussed.

It was the opinion that it is desirable for the manufacturers to work towards a common impedance, but it was felt undesirable at the present time for the operating companies to specify any impedance value, as such specifications would tend to hamper the satisfactory development of the art in the manufacture of transformers.

It was recommended that the manufacturer indicate the impedance on the name plate of distribution transformers in sizes from 50 to 200 k.v.a. so as to permit the proper selection for multiple operation.

Basis of Performance Guarantees

The following recommendations covering performance guarantees apply to all classes of power and distribution transformers.

(a) All guarantees covering characteristics and tests should conform to the A. I. E. E. Standardization Rules.

(b) Performance guarantees for transformers equipped with taps should be based on normal voltage and full winding. The temperature guarantee should apply to full k.v.a. loads at all standard tap voltages not exceeding a range of 10 per cent from normal.

ELECTRICAL POWER FROM LIGNITE IN AUSTRALIA

The city electrical engineer of Melbourne, in delivering his presidential address before the Victorian Institute of Engineers on March 22, proposed the building of a large power plant in Melbourne which would utilize brown coal or lignite, of which there are large deposits adjacent to Melbourne. From official statistics for the State of Victoria he showed that for the last 10 years there had been a steady increase in the number of factories utilizing electrical power and in the actual horsepower used.

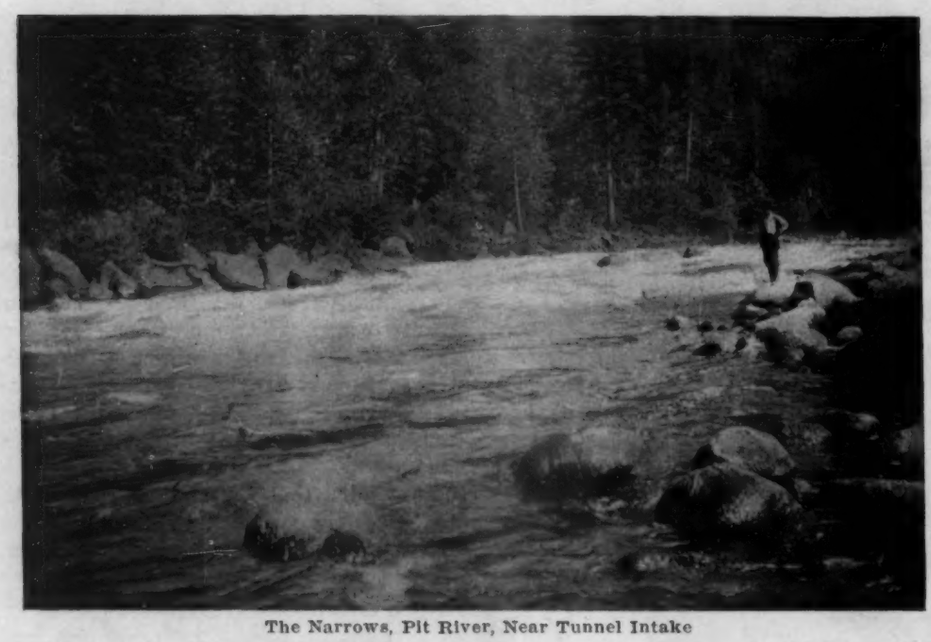
	Factories Using Electricity	Actual h.p. Used.
1905	349	2,174
1907	558	4,182
1909	802	6,746
1911	1,164	11,764
1913	1,579	18,732
1914	1,782	22,584
1915	1,915	26,385

THE PIT RIVER POWER PLANT

BY JOHN A. BRITTON

(The newest and biggest undertaking by which the Pacific Gas & Electric Company proposes to harness the waters of a Northern California mountain stream for the generation of two hundred thousand horsepower was announced on page 401 of the issue of the Journal of Electricity, May 15, 1917. Interesting details of this great undertaking are herewith set forth by the vice president and general manager of this company, which will undoubtedly prove of intense interest to engineers throughout the West.—The Editor.)

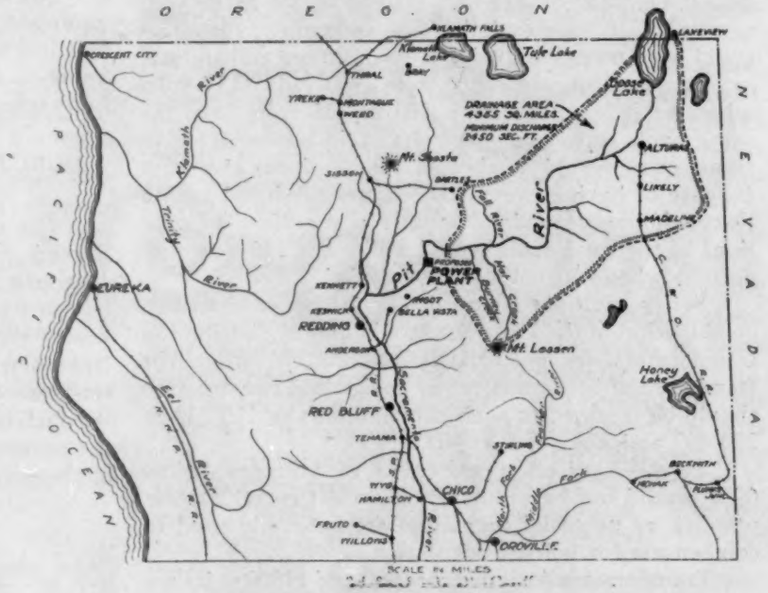
Some idea of the Pit River's potential development value may be gathered from the opinions of engineers, who have not hesitated to pronounce it the best stream in the state of California. But its development, so far, has been delayed, partly for lack of an active market for its output of electric energy. Then, again, it lies so far from the distributing centers that not until recent years have engineers been able to transmit electricity at sufficiently high voltage to cover the distance. The Pit River possesses an enormous advantage for power purposes in that its variation in stream flow during different seasons of the year is quite small. This is due to the volcanic formation of the country through which it flows on its way to the Sacramento, a volcanic formation that holds water like a sponge. This will be appreciated when I tell you that the minimum flow of the Sacramento River at Sacramento is 4000 cubic feet per second, and that to this minimum the Pit River contributes no less than 2450 cubic feet per second.



The Narrows, Pit River, Near Tunnel Intake

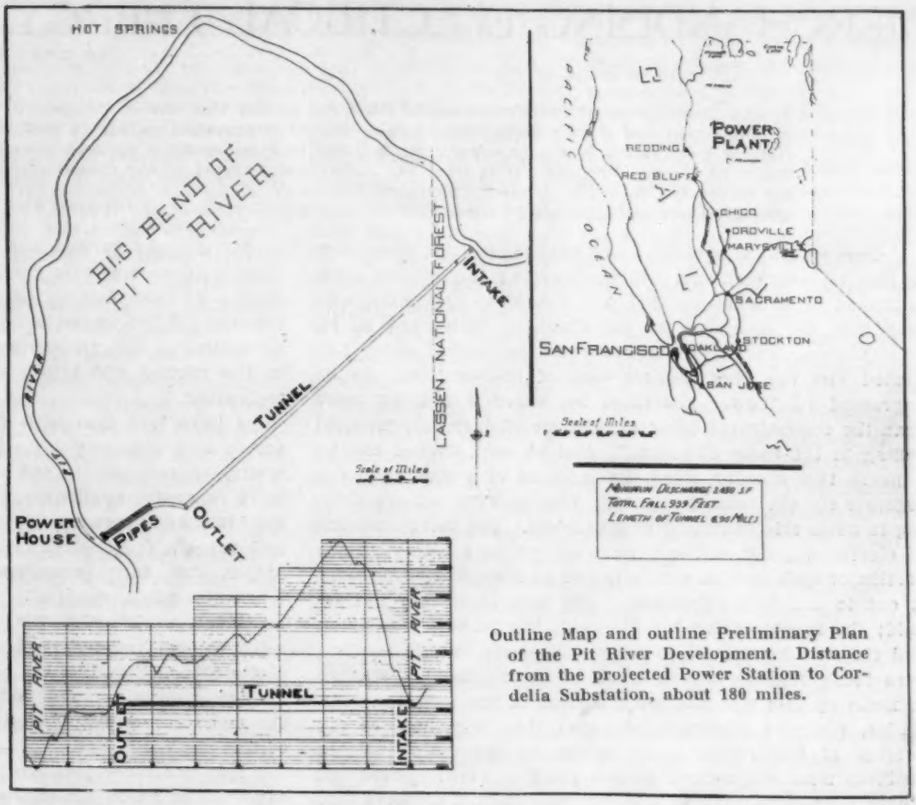
In view of the constantly increasing demand for electric power for various purposes, agricultural, industrial, mining and other, in addition to the domestic purposes for which it is almost universally used, the Pacific Gas and Electric Company has deemed it wise to keep a watchful eye upon prospective sources of addition to its electric distributing system. The Pit River project is an attractive one in every way, for it affords us an opportunity to develop at one point, in one power-house, an amount of electric energy more than equal to the present combined capacities of all the other power plants, eleven in number, owned and operated by the Pacific Gas & Electric Company. The amount that it will cost the company to perfect this development appears large at first sight; but when you measure up this total cost of approximately $17,500,000 with the amount in horsepower of electricity we will be enabled to place at the disposal of our consumers you will see that this entire project represents an average cost per horsepower remarkably low for any electric development.

Furthermore, we calculate that this expenditure and its result will take care of our company's needs for from ten to fifteen years, at the present rate of our



The New Project and Its Drainage Area

growth. It will take approximately five years to complete the work which is already under way, but when these five years are up we will be in a position to meet all demands upon us. Man's inventive genius is ever at work and electric power has been brought into requisition in ways undreamed of a few years ago. The industrial feature of California's development is assuming larger proportions every day. This condition has been brought about by the availability of cheap electric power. The word has gone forth that every available acre of land in California is to be made use of to meet the food situation; and here, again, electricity comes into play. I think, therefore, that the public service corporations will have need of all they can manufacture and distribute in the way of electricity, gas and water in the years to come.



Outline Map and outline Preliminary Plan of the Pit River Development. Distance from the projected Power Station to Cordelia Substation, about 180 miles.

The Big Bend of the Pit River and Its Relation to the Great Power Centers of California

When the Wise power plant was constructed we installed the very largest and most modern water wheel up to then perfected. This wheel has a generating capacity of 18,500 horsepower. Our engineering force tells us that it is quite possible that by the time we are ready to purchase the necessary water wheels for equipping the plant at Big Bend, wheels will be manufactured with a generating capacity of 30,000 to 40,000 horsepower. In fact, Mr. Baum expects the water wheel and generator units to be about 50,000-k. w. capacity. This is no idle dream, since they are already manufacturing for steam plants units of 80,000 horsepower. Electrical science is progressing now by leaps and bounds. Ten years ago an efficiency of 70 per cent was considered excellent, whereas our Wise installation has an efficiency of 91 per cent. We look to this Big Bend plant to mark a new era in the electrical development not alone of this State, but of the world. For this reason we propose to follow the advice of our engineers and postpone the actual purchase of wheels and generators as long as possible, and, in fact, centralize the financing necessary for the development of this vast quantity of power in the last two years of the work.

THE THERMOMETER AS A PRESSURE MEASURER

According to the 1917 report of the committee on prime movers of the National Electric Light Association, with the advent of high vacuums, Bourdon gages became of little value in the determination of the turbine back pressures. Not only does the inaccuracy of this type of gage render it useless, except in a very general way when starting up, but continual changing of the atmospheric pressure makes its indications subject to large corrections. Even the mercury column has found a competitor in the thermometer, which in some cases has entirely displaced it. The fixed relation between vapor pressures and temperatures, regardless of atmospheric changes, gives the thermometer the preference as it is not affected by such changes. A thermometer having a range from 60 to 120 degrees F. and fitted with an overflow chamber large enough to accommodate the expansion of 240 degree temperature (to prevent damage to the instrument in case the vacuum is lost and the turbine operates non-condensing), is a much more accurate operating instrument than the mercury column. Such thermometers are easily read to tenths of a degree, whereas, to obtain the same accuracy with a mercury column, corrections would have to be made for total errors in excess of one-half of one-thousandth inch (0.0005).

The error due to the presence of usual quantities of air in the stream of a steam line is negligible. With a steam flow of 100,000 lb. per hour and an air leakage passing the thermometer amounting to 5 cu. ft. per minute, the error would be much less than five-thousandths (0.005) degree, which is equivalent to two ten-thousandths inch (0.0002). This is an excessive amount of air to be present at the turbine exhaust. Most of the air usually leaks in around the exhaust piping and condensor joints. The difficulty of obtaining an average temperature is no greater than of getting a location where the vacuum connection is not influenced by eddies in the steam.

MERCHANDISING ELECTRICAL ENERGY IN THE WEST

(The merchandising of electrical energy is a problem, the proper solution of which has far-reaching consequences throughout the West. Blessed with enormous potentialities for future power development, the hydroelectric industry in the West but awaits the careful analysis of economic marketing of this power and there will be ushered in an era of unexampled industrial and agricultural prosperity. Here is a discussion of timely interest, participated in by a number of well-known authorities on merchandising of electrical energy. It is from the stenographic report of the commercial committee sessions at the Riverside Convention of the Pacific Coast Section N. E. L. A., April 19-21, 1917. Its contents should receive an unusual welcome by readers of the Journal throughout the West.—The Editor.)

Chairman S. V. Walton: Our next subject for discussion is that of merchandising. In approaching the subject I am reminded of a definition that Mr. Frank A. Vanderlip, who said that the operation of the Chicago, Milwaukee & St. Paul Railway by electricity generated by falling water furnished him the very keenest idea of co-operation. As he expressed it, "Power generated by water is nothing more than the concentrated effort of millions of drops of water all falling in the same direction." And he said, "What can be done in this country when the millions of people all work together for the same purpose?" That is what we are striving to do in this merchandising problem. The merchandising of electrical goods and electrical energy go together. Each portion or each section naturally has an organization to carry it out to the best advantage. The central station has its field; the manufacturer has his field; the jobber, the dealer, and the contractor, and so forth. We have in this meeting here today representatives of all of those elements that go to make up this merchandising portion of our business. Mr. Childs, who has prepared the paper that is printed in the Journal of Electricity, is an expert on the merchandising business from the central station point of view. There are others here, who have proven by their flannel trousers and other signs of prosperity that they are experts in their branches of merchandising from other points of view. We will be glad to hear from all of them. I am going to ask Mr. Childs to abstract his paper.

A. W. Childs: The general subject of merchandising is not discussed in this paper. It is of too broad a scope. The intent of this particular paper is to discuss the relation between the central station, and the manufacturer, contractor and dealer, for the purpose of showing, first, why the central station began the merchandising of appliances; second, why the central station should continue to merchandise appliances, and third, the co-operative opportunity of the dealer.

I have endeavored to show the progress in the merchandising of appliances covering a period of about eight or ten years, beginning with the work of introducing the first lamp socket appliance, the electric laundry iron, showing how it was carried into the home by salesmen who worked from house to house, left the irons on trial, and after much effort succeeded in popularizing the laundry iron. And leading on from that, through the various stages up to the present time, when all electrical appliances are extremely popular, and in common use, I have shown that the preliminary work and much of the promotion work up to this time has been due to central station effort.

Then we pass along to the question of selling prices. The manufacturers tell us that there is a limit to the amount that the consumer will pay, there is a fixed limit to the cost of production, and between these two the dealer must get his revenue. On the other hand, there is a growing tendency to increase the lamp socket appliance cost to the consumer in order that the dealer may make possibly more profit on a smaller sale, and it appears to me that this is contrary to the purpose of the central stations all through these years in endeavoring to get a large output.

I have touched somewhat on the electric range promotion, showing that it is in its early stages, similar to the early development of the iron, with the exception that the great use of the smaller appliances has paved the way for the range and made its introduction much easier. I said yesterday that the harvest was now ready in the range business. That is true. However I might amplify that statement somewhat. The harvest is ready but the crop is small. The acreage planted is not very large at present, but the proper harvesting of this present crop and the replanting of the seed in the ground will bring in a much larger return at each replanting.

I have said that with the central station selling at list prices and confining its sale to appliances consuming 500 watts, approximately, and over, with a great deal of the more expensive appliances, that is, vacuum cleaners, washing machines and those articles which sell for considerable money and carry a fair merchandising profit, left entirely with the dealer, that such encouragement might be considered sufficient by some, especially when coupled together with the continued work which the central stations perform in creating the demand and re-creating it, and finding new uses for electricity, as was brought out this morning in the industrial heating discussion; and finding new sources of revenue for the manufacturers, jobbers, contractors, and dealers, outside of this appliance line.

I do not know just how far the central station might be expected to go in its efforts of co-operation. You have all met the fellow who asked for a cigar, when given it asked for a match, and when looked at inquiringly, said, "I will smoke it myself." Possibly you think the manufacturer of the cigar ought to furnish the matches, or that the cigar dealer ought to furnish them; if you are well supplied with matches you may be glad to furnish them yourself. On the other hand, a little girl five or six years old came to her father hand in hand with her chum, and asked for five cents. He was quite serious and chided her for asking for the money. As he was scolding her, but with a twinkle in his eye, she looked at her little chum, and whispered, "He is going to give it to us." So there you are. There is a great deal to be said on both sides.

Chairman: Mr. Childs' match story makes me think of the Scotch story that I heard the other day. A Scotchman, had lived in San Francisco so long he forgot he was a Scotchman. He had heard these stories about how close the Scotch are in financial matters. He went back to Scotland and visited a few months, and on his return to San Francisco he knew the Scotch were close all right. He said, "I left my hotel one evening, went down in my pocket and found I did not have a match to light my cigar. I stopped at the first cigar store I came to and said to the attendant, 'Can you give me a light.'" The attendant said he had no light, and I replied, "Well, out in San Francisco we have these electrical cigar lighters that do not cost you anything." The cigar dealer said, "Here is a box of matches for a half-penny." "No," I said, "I don't want to buy any, I just want a light." And, do you know, I had to walk clear back to the hotel, six blocks, to get my cigar lighted."

Before the discussion of Mr. Childs' paper starts, I want to give some figures I have just been compiling here. Late in November, 1915, our company started a co-operative sales campaign of lamp socket devices, participated in by the jobbers represented in San Francisco and the dealers in our territory, on a plan that has been heretofore published. The campaign was for fourteen months. The detailed figures as to all the results of the campaign we have been unable to get, probably never will get, because you cannot measure in fig-

ures the good will in various ways we have received as a result of this co-operative sales campaign. I asked the jobbers for some figures in general round numbers as to the number of appliances and wattage in appliances that they sold from the date of the beginning of the campaign up to its close. Of course, there is no way of telling how many they might have sold if this campaign had not been started, but I am going to give the figures, as they are rather startling in their size. The aggregate from all of the jobbers of lamp socket devices sold during the period of fourteen months, from the first of December, 1915, to the thirty-first of January, 1917, in the territory in which we operated very largely, was 45,000 pieces aggregating about 27,000 kilowatts. That is a startling figure when you get it all together.

D. E. Harris: Mr. Chairman—I am much interested in what you just said, due to the fact that Mr. Childs in naming those who are interested in the merchandise problem, omitted to mention the jobbers. I think you will agree with me that since we put out 27,000 kilowatts on the central station's lines that the jobbers play an important part in the merchandising of current consuming devices.

In getting back to this merchandising problem, I would like to reiterate what Mr. Britton said yesterday, regarding the importance of the electric industry to our country, and to the public at large; also, the desirability of unity of action.

The merchandising problem possibly can be defined as one of the businesses—I would like to define good business as that of buying and selling at a profit, satisfying and serving. We could possibly divide it into three parts, which would represent our industry: Capital the employer, the employe, the public the consumer. I do not believe that any industry can thrive if co-operation among the three is lacking, nor do I believe that any business can succeed that has a dishonest or indifferent partner; each owes a duty to the other.

In the past there has been a lack of understanding between the central station and those others that are interested in the merchandising problem. It seemed that the central station was taking the part of the lion guarding its prey; it was all this and the other fellow had nothing to say, I am convinced after attending the meeting yesterday and noting the enthusiasm displayed, that we have at last reached a common ground, where we can get together and consider the problems as one—central station, contractor, dealer, manufacturer, and jobber. We cannot get together as business men, which we all are today, unless we consider the problems of tomorrow. We are building up an industry, an industry that must grow for the future, and in building up that industry, let us work co-operatively. Let us believe in a "live and let live" policy.

Mr. Childs stated in his paper if the central station handled the selling it could utilize its buying power, absorbing the expense, and so forth. That is true, but, I believe, that was the policy in the past. It was the central station policy in the past, to buy in large quantities, and sell at a price which did not permit others in the industry to compete. It necessitated small concerns buying materials regardless of quality in order to compete, the quality of these goods must have reflected on the service of the central station. Mr. Childs went on in his interesting paper to state that in Los Angeles last year when the contractor-dealers were given at least half a show, they outsold the central stations in Southern California two to one.

On the subject of electric ranges Mr. Childs stated in his paper that he believed the electric range was the problem of the central station, and also, for the time being, the central station should continue to do the wiring. I am willing to agree for the sake of argument, that the electric range is a central station problem, but I cannot agree that the wiring is a part of the central station's work. The contractor and dealer, after all, must be considered, if we want co-operative work; if we want enthusiasm among those interested in this industry, we must co-operate with them, because when you destroy enthusiasm you are going to destroy the backbone of this business. The contractors, dealers and jobbers are interested in this problem.

I might define enthusiasm as being in deadly earnest. We do not want enthusiasm that is going to melt away when disappointments or obstacles get in the way, but the steady sort. The central stations can do a great deal towards keeping up the enthusiasm in all branches of the industry. As business men we should lend our co-operative support in building up the electrical industry, including the manufacturer, jobber, electrical contractor and dealer, that in the end we may all prosper and be a credit to the industry.

Mr. Wall: Women control education. Education is what we need right now, education of the public. There is a cornerstone. Many of the wives of the men here are members of women's clubs. I want these ladies to talk electricity while they are sipping their tea. They can be made to exert a tremendous force in educating the public. They can help us more than anybody else in supporting our propaganda for the electric home, in spreading home happiness abroad in the land. The romance of adventures of electricity appeals to women. It can be made to appeal to them.

I move that a publicity and educational sub-committee be appointed, at least one member of the committee to be a woman.

Chairman: Mr. Wall, I hardly think the motion is necessary. The recommendation going in our minutes is obvious. The points which Mr. Wall has raised are of importance, and they are obvious. I think every central station representative has done considerable work along the lines suggested by Mr. Wall. I think the possibility of having a public sub-committee of the commercial committee is a very good one, but should be left to the following commercial committee to handle.

Chairman: Who is the next victim on this subject of merchandising? Mr. Berry of the Western Electric Company.

W. S. Berry: I thank you very much, Mr. Chairman, for being called on for a few remarks. In opening, might say it is a great privilege for the contractors, dealers, manufacturers and jobbers to be able to attend these meetings and address you on some of the things in which they are interested.

Of course, the jobbers, of which I am one, have long realized that much could be accomplished through exchange of ideas. The commercial departments of the central station, being in reality a new organization, had to go through a process of education and try out some of their own theories, and see if they could not put on their lines devices which jobbers and dealers were also selling. This was unfortunate from the jobbers and dealers viewpoint, as the central stations, in forming this new department, generally put in charge men who knew nothing about the merchandising of goods and did not think it worth while to consult jobbers and dealers, who had spent years in working out selling campaigns.

Now, owing to the knowledge acquired through hard experience, the commercial department has taken a step in the right direction at this convention.

Large telephone companies are organized with four departments about on the same lines as your central stations and the commercial departments of telephone companies stand on a par with their other departments. The commercial department of the central station has not in the past been working along co-operative lines. In other words, each central station, I think, has been trying to solve its own problems of merchandising. Some of them have gone direct to the consumer. The consumer is the one whom the central stations, manufacturers, dealers and jobbers have all tried to reach, and some of the commercial departments of the central stations have done very good work along those lines. I, myself, believe that the proper method of distribution of electrical appliances is through the contractor-dealer. On

the Pacific Coast we have somewhere in the neighborhood of 3000 contractor-dealers who are awaiting the opportunity to get into the work and help dispose of these goods. Of course, it has been a hard proposition to educate these contractor dealers—I am speaking about approximately 95 per cent of them—as to the best method of merchandising goods. But we jobbers, together with some of the bright minds in the dealers' association, have been trying to work this out and recently have had considerable assistance given us by the Pacific Gas & Electric Company's commercial department. We have been working for the past six years to get the support of the dealers. This seems a long time, but before we accomplish what we expect, it will probably take six years more. I think we can now guarantee the central stations a majority of the 3000 electrical dealers on the coast working with one idea, the same idea as yours, to sell electrical devices to the consumer—when you have that organization educated properly, and doing a good job, then you have an organization that will help solve your problems and will put the goods on your lines in large quantities and at a reasonable cost. I thank you.

Chairman: Mr. Frank Somers, San Jose. "Don't Wurry."

Frank Somers: Mr. President, dear boys—I believe in God. I believe in co-operation. I believe in the proper distribution of supplies, manufacturer to jobber, jobber to retailer, retailer to consumer. I believe that the contractor and dealer is the natural and best solicitor that the central stations have today. Why? In the first place, he is cheap; he does not get paid in soliciting for the power company, but it is his bread and butter, or his success, and he goes to it with a vim.

I will just relate one instance to show you how I think all contractors are that. Three years ago the power company started out on an irrigation campaign. I worked night and day and Sundays educating people who never heard of an electric motor. I went from house to house and ranch to ranch, along roads where there would be no lines, nor prospect of lines. Some of these people had been called on every week for six months, and some of them every month for a year, and when I finally sold a motor, it meant the man had been educated for from six months to a year and a half. The result of that business was that I placed on the lines of the Pacific Gas & Electric Company in the Santa Clara Valley 3200 horsepower in small units, from 1 to 60 h.p., and one to each customer. I presented the power company with 1400 or 1500 h.p. they never would have sold, because the company's solicitor went along the one line, and if the man would not listen to him, he went on. I had to get the difference between the cost of crude oil and electricity. And if the man was not home and his wife did not know when he would be, I would wait until he did get home, even if I had to wait until after dark. I maintain out of that 3200 h.p. there was 1400 out of that that was due to my personal efforts.

The dealer believes he is a natural born solicitor, for the reason he is closer to the consumer; he is a smaller man; he is more on a level with the consumer. Of course, I have got some of my ideas from ancient history. Things have improved a great deal. But 21 years ago when I went to work for a power company, they kept the cashier in a cage, and they employed a bouncer who looked like a railroad policeman to throw the people out if they made any complaints. Of course they have since learned the fallacy of the policy "The public be damned," because they have found out if you have a man as a friend you are going to have him as a customer. While all these things are dying out, while there is a vast difference between the consumer and the central company, I suppose it will always be that the consumer will be down on the electric light company, the railroad corporation, and the telephone company, or the man who makes sugar. You will always hear the same statements, that the company gets the current for nothing, it is made out of water.

Chairman: Mr. Somers, will you discuss the lamp socket appliance business, while you are on your feet?

Frank Somers: From the lamp socket appliance standpoint I believe that bonus the company gave us last year was a Christmas present; I don't believe we earned it; we didn't work hard enough; it was too easy, when a man comes to get fifty cents for selling a curling iron heater that sells for $1.75 and costs $1.25. I think that is rubbing it in. I think they ought to put the bonus on the bigger horsepower.

The contractor and dealer ought to be the clearing house for the complaints, (and he is in many cases), between the lighting company and the consumer. He understands his customer better and he can deliver the goods.

And I also maintain, coming back to the supply proposition, if you put the central station and the dealer on the same basis, give him the sale prices, or the same goods at the same prices, that the central station would be mighty soon out of business. My place of business is next door to the power company's office; I have been established sixteen years. When they sold lamps at 25 cents and I sold them at 30 cents, I still sold $2500 worth of lamps, and when they sold irons less than I did, I still sold irons. I maintain the public would rather deal with the dealer.

Some years ago, the electrical contractor found it uphill work to attain success or even earn a living. His greatest difficulty was in trying to compete with the power companies, it being impossible for him to sell goods below cost as they did.

Wiring was then in its infancy.

Poor work was done by both contractors and power companies—any makeshift to deliver the current. The power companies doing a broader business and having more money, soon found out the difference between good and bad wiring and from that time on ran rough shod over the contractor and dealer. Not understanding this, many have made good, and are today successful business men, but they do not cooperate with the power companies because they have naturally been made to feel that the power company is their greatest enemy.

The day of co-operation through the electrical industry is at hand and it is up to you, broad big business men to meet the contractor half way and let him know that we are all working toward the same end, the electrical industry on the biggest possible plan, manufacturer, manufacturers' agent, wholesaler, central station, electrical contractor and dealer "all together all the time for everything electrical."

Chairman: Mr. Walton of the Southern California Edison Company.

C. S. Walton: I am impressed by the remarks that have been made, and agree with them in the main, but I wish to call attention to the fact that the problems which are presented to us in this particular matter are not unlike those which were dealt with yesterday, because the large company and the small company have to meet them in different ways. The large company has solved a great many which the small company cannot solve from a recital of the conditions which are now prevailing with the large companies. I have heard it said, and it possibly is quite true, that the large companies do not derive any great benefit from either the national meeting or the sectional meetings, or better perhaps that they do not derive in measure as much benefit as the smaller companies.

It seems to me that it might be said that the jobber, the contractor, and even the manufacturer, is the product of the central station. In the case of the small company, remote from the jobber, remote, of course, from the manufacturer, and with possibly only one or two small dealers to cooperate with, it would be justified, for the time being, in making its own campaign and not necessarily considering, to the detriment of its interests, the small dealer.

I feel sure that the wonderful saturation which some companies are experiencing in lamp socket appliances on their systems, would not exist if it had not been that at the start

the company itself, with its facilities for reaching the consumer, ignored for the time being the interest of those in the business more indirectly. It seems to me that we have arrived at a fortunate condition in those companies where the public are educated to have confidence in the lamp socket appliance and regard with favor any new appliances brought to them. Under such conditions it is most desirable that the prices charged by all should be exactly alike, and the burden of the distribution might then be left with the contractor-dealer. I am happy to say in the company I represent that condition prevails. We maintain prices; in fact, we maintain prices so faithfully that we are being undersold every day in the department stores and by some dealers. But we are well satisfied. The goods are going on our lines and on those of our friendly competitors. The object of the companies is served by the building up of the load, and we are very glad to see them undersell us.

But in the small companies in the smaller towns, I believe a great deal of work will still have to be done by the central stations. I believe they are justified in doing it until such time as their public is properly educated to the benefits and uses of lamp socket appliances, when naturally the dealer and others interested in the sale of such goods may come in and take their place, and then it is highly desirable that the central station should maintain prices and co-operate in every way with the dealer.

Chairman: Mr. John M. Morris, will you kindly come to the front?

John M. Morris: In working towards better co-operation of the three big industries, a detail was called to my attention that I would like to have discussed here, and that is in the development of this business the central station often sells appliances on terms to the consumer. That puts the dealer up against it as he is not in position to give that credit to the consumer, principally because he is not in position to collect the payments.

I would like to ask two questions: First, is it necessary or desirable in order to get out these lamp sockets, to give terms to the ultimate consumers of say a dollar down and payments for two or three months. And if it is necessary, can it be satisfactorily arranged so it can be worked out?

I suggested a scheme to certain central stations working that out along the line of the dealer selling the goods and delivering the apparatus on the approval of the credit by the central station, and then turning the accounts over to the central station. I would be very much interested to know if that problem has been worked out in other parts of the country.

Chairman: Mr. Morris' questions are apt, and before we ask for an answer from the central station men, I would like to ask an electrical contractor and dealer who is exceptionally qualified to speak on those subjects—Mr. Kimball of Oakland.

Hugh W. Kimball: Mr. Chairman and gentlemen—In regard to the question asked as to the manner of handling the sale of electric appliances on the term payment plan, will state that there are several different ways of doing this. One central station formulated a plan whereby the dealers could turn over to them their contracts for appliances sold on the installment plan, adding ten per cent to the regular re-sale price for the handling of the account by the power company, covering monthly payments on a period of ten months, or more. The dealers were given this privilege but I believe that the plan was used but little. However, the plan was mapped out wherein it could be handled with little trouble, as the collections could be made by the central stations together with the collections of the regular monthly bills for current. I think most of the electrical dealers handled their own installment payments, offering the public credit extending over a period as high as ten months' time, and experiencing little difficulty in financing the matter. It is certainly necessary that appliances be sold on the monthly payment plan as the various department stores, furniture houses, etc., are offering and advertising the long monthly payment plan on similar articles as well as on electric devices, vacuum cleaners, washing machines, etc. My own firm is still carrying on this plan and find it easily handled. We find, however, that fully seventy-five per cent of the customers do not want to be bothered by installments, so that in itself it is a minimum consideration. We thought at first that it would be necessary to take this matter up with our bankers for the purpose of handling the paper which, of course, could be easily arranged by any firm but the volume was so small in comparison with the total amount of business that it was not necessary and I believe that any ordinary firm or electrical dealer could offer such a plan to the people and find no trouble whatever to extend all the credit necessary. Of course if it should reach to any extent they would have their bank to fall back on.

Chairman: Does that give you an answer on it, Mr. Morris?

J. M. Morris: Yes, thank you.

H. W. Kimball: In regard to the work of the contractor-dealer in co-operation with the central station on the output of current consuming devices, and of course, ultimately the consumption of electric current, in Mr. Halloran's report yesterday I was a little surprised to find the great number of central stations in California and the large majority of members of this organization represented by the smaller companies. Before going further I wish to say that for some time, as mentioned by Mr. Berry, the electrical jobbers and contractor dealers have met on the common ground of organization for the betterment of the electrical industry, better salesmanship, broader and bigger business methods and general co-operation with other factions of the industry. We have formed the California Association of Electrical Contractors and Dealers and for some years have been meeting regularly for the purpose of co-operating on this plan. Our work has been largely educational and we have made rapid advancement in the art of merchandising and handling our business. Some years ago the idea of an electrical contractor and dealer handling the exclusive sale of appliances would have seemed to me to be out of the question, but we are well organized now and have made remarkable advancement in our various businesses and I feel that we are at the point where we can handle the entire output of current consuming devices and handle it to the betterment of the central station people as well as the manufacturer and ourselves.

Now in regard to these smaller companies, I think the great problem pertaining to the sale of electric appliances and getting them into the hands of the consumer is not in the large cities but rather in the smaller towns, and the central station people could give a great deal in assisting the California Association of Electrical Contractors and Dealers in getting the proper people in their various districts for the handling of this product, with the result that in a short time every district and every community will have a well established representative dealer. The jobbers of electrical appliances have assisted the contractor-dealer in the advance of this business; they have instructed the various salesmen on the road to interest their customers in this movement and to educate them along the lines of co-operation in sales effort. If all the central station men in their various districts will bend an effort this work will materially increase to the benefit of all.

The central stations must realize that every well organized electrical dealers establishment, every electrical salesman and every electrical mechanic conducting himself in the proper manner is an additional salesman of kilowatts from which you will directly benefit and he is not on your payroll either.

I have visited a great many of the smaller towns in California and I find that almost everywhere there is a sort of loggerhead condition between the central stations and the

various dealers in the towns. The central station man's attitude is that they do not believe that the man engaged in the electrical business in their particular district is capable of meeting the public properly on electrical problems. I do not know but that to a large degree this attitude is justified, but nevertheless it does not tend toward progress in the industry. Of the two, the central station man is financially stronger and more securely placed in the community in a business way and he can materially help or hinder the progress of the local electrical contractor dealer in his district and by so doing help or hinder his own progress. Bear in mind that in the San Francisco Bay section alone there are upwards of 3000 men engaged either in the business or in the employment of men who are in the business of selling and installing electrical equipment and every one of them is indirectly a seller of kilowatts.

If the central station men will take an interest in this movement, give a little encouragement, a few suggestions now and then and support generally to their various dealers, I am sure it will help. The California Association of Electrical Contractors & Dealers want to see their organization well represented in every district. If there is any central station man who believes that the contractors and dealers of his section are not of the proper kind, our association can aid him in interesting the proper people to locate in his district or if the electrical dealers already established in any section are not bending their efforts in the direction of progress we are ready to assist you in their betterment. A letter to our secretary's office in San Francisco will start this movement. Interest yourself in the electric dealer, encourage your local men to join our organization and we will help you make of him a good salesman of your product.

T. E. Bibbins: I have read Mr. Childs' paper with a great deal of interest and indorse it almost in its entirety. The one or two points I take issue with are not important. The paper itself is historically correct and logical.

I am impressed with this: That the problem of selling becomes easier as the articles are sold. The most difficult thing to do, as any seller will recall, is to dispose of the first article and see that it is well sold. In other words, that it stays sold, and that article then sells another and so on.

For that same reason, it was necessary for the central station,—and particularly the Southern California Edison Company,—to start its campaign of sale, and the work that it has done is undoubtedly monumental. The same situation applies today to the range. I agree with Mr. Harris that the sale of ranges is not a dealer problem today. It is the duty of the central station to start the campaign. I do, however, feel that the connecting up is distinctly a contractor-dealer proposition.

Now, this organization, I understand, is not a charitable organization. It is neither a branch of the Red Cross, nor in any way is it here to dispense charities, and therefore, what we are here for is to exchange ideas and find the logic of the situation. If the manufacturers, jobbers or dealers, who are obliged to sit on the outside while other branches of the industry sit within in its deliberations, it cannot be as productive of good as if all sat together and conferred on each phase of the whole problem. We believe, speaking from the jobbers' standpoint, that we have a right to exist. In other words, there is a part in the struggle of life in which we have a place. We believe also that our associates, the contractor-dealers, have a part.

Some people are rather inclined to feel that after all, the jobber, not particularly an electrical jobber, has not a right to exist; that it is a fungus growth. Perhaps it is in many commodities, but in the electrical problem, it can demonstrate its right. The electrical jobber brings together the interests of a great number of diversified manufacturers; he brings the conduit, made by one company, the rubber-covered wire made by another, the pole line hardware made by another, the incandescent lamp by still another, and so I might go on. He brings them all in under one selling organization, all under one roof, and because of that fact, he is able to administer the problem of distribution for the various manufacturers as they individually could not do. Therefore the jobber performs a function, and he must of necessity ask his price in order to pay his expense.

The contractor-dealer is theoretically so distributed—competition makes it so—over the territory, that he in turn performs a function, and that he is, as it were, the nerves in the tips of the fingers for all the other industries.

I contend, gentlemen, that this business of ours is made up of four parts, and each part is essential to the other: the manufacturer, the central station, the jobber, the electrical dealer; one without the other could not perform the service which we jointly undertake; and, therefore the reason and logic for this meeting.

To my mind, Mr. Chairman, as Mr. Kahn has put it, this commercial meeting is the backbone of the whole. The responsibility of the engineers is to find a way to carry out our idea. All that the bookkeeper does is to account for the things that we do. And so, gentlemen, according to my theory, we are the ones that really cause the blood to flow all through the body. Now, if all parts of this body that I have referred to are properly served, if it is hardy in its growth, each must partake of the heart's blood; Mr. Contractor and dealer must have his profit, must have his right to exist; therefore, any policy which is destructive of that part of the body, such as a low price campaign, which destroys that particular part of the body interferes, in the end, with the growth of the whole body.

In the performance of the central station function the dealer should be borne in mind and to do this the other side of the problem, should be presented so that we can all logically work forward to the end of serving the public, and that is, in the final analysis, the only warrant we have for existence—that of service. (Applause.)

Chairman: Mr. Bibbins has stated his case very clearly. I would like to get back for a minute to the questions raised by Mr. Morris, and get an expression from the central stations. I think Mr. Newbert of the Pacific Gas & Electric Company has a good idea on that very subject of installment payments.

L. H. Newbert: Mr. Chairman and gentlemen—Regarding the question which Mr. Morris raised of carrying the installment payments for dealers: The Pacific Gas & Electric Company, made such an arrangement some eighteen months ago. When we did so, it was thought that there would be quite a demand for installment terms. However, such did not prove to be the case during the campaign that Mr. Walton referred to; that is, very few of the dealers apparently found it necessary to call upon the company to carry the deferred payments for them. I have asked some of them why that was unnecessary, and found that the most of them are able to arrange to carry those installment payments themselves and thereby earn for themselves the extra ten per cent which was charged. Others who were not in a position to carry them themselves were able to make satisfactory financial connections whereby they were able to get the money at less than 10 per cent, and getting an extra 10 per cent on the sale, made them a small additional profit.

The installment plan we know well. In other lines it has resulted in a great many more sales than would otherwise have been made. Particularly is that true of the publishing business. I think probably every one of us in this room has purchased books because of easy payment plans that we would not have otherwise purchased, and I, myself, have been somewhat at a loss to understand why there has not been a greater demand for installment terms in connection with the sales of appliances.

I think it is true that in the earlier days the Southern California Edison Company and some of the other companies in Southern California found that that plan worked

out most satisfactorily and resulted in enormous sales, sales that in all probability could not have been made on a cash basis. However, for some reason that has not been the experience of our company, except possibly in connection with the sale of vacuum cleaners, which, of course, is not a particularly attractive load to the central station. The vacuum cleaners in our section are sold largely on the installment plan; so is the electric washing machine, but the smaller devices are generally not sold on that basis.

Chairman: Mr. Simpson of the Federal Sign System (Electric) will now address us.

T. W. Simpson: I ask you gentlemen not to be alarmed as I flash this paper on you, that it will only take four minutes to read it, which is within the time limit.

The argument I desire to place before you can best be presented by a series of suggestive glimpses of Western conditions of fact that you can all verify.

(1) There is one city that I believe all agree possesses the poorest and most backward electrical conditions in the West. I refer to Tacoma, Washington. Electricity rates are absurdly low. It is served by a municipal plant that sells nothing but electricity, and does not compete with the electrical sales industry in any way. Here one would think the electrical dealers would be in clover. Yet Tacoma has comparatively the fewest electric ranges, the poorest and cheapest electric signs, the most miserable window lighting, and is way, way in the background when judged by any of these standards by which we judge a city electrically.

(2) The Salt Lake City central station believes in aggressive dealing in load building devices on a scale greater than that found in any other city of the West. It does not limit itself to articles of less than $5.00 as does the Southern California Edison Company but sells anything and everything. Its policy is live and let live in that it does not cut prices, yet it sells on long terms and does everything else to get the business. There is no city in the West where the electrical industry, dealers and central station alike, is in a healthier condition than in Salt Lake City. As an example, the Salt Lake City central station sold over 350 electric washing machines in the first three months of 1917, yet it is a fact that there is a single dealer in Salt Lake City that sells seven hundred washing machines a year.

(3) Southern California Edison Company and Pacific Light & Power Corporation have served Southern California on the plan of the patch quilt. Hollywood and South Pasadena would be P. L. & P., Monrovia, Pomona and Long Beach would be Edison and so forth. The communities are similar, yet until a few years ago the P. L. & P. did not campaign electric appliances while the Southern California Edison actively engaged in the work. Strange as it may seem, a shrewd electrical salesman would go to Monrovia, Pomona or Long Beach with a far better assurance of making a success than if he went to Hollywood or South Pasadena.

(4) In 1915 the Federal Electric Sign Company operated an electric sign campaign with the Pacific Gas & Electric Company at Oakland. Our Oakland competitor saw ruin staring him in the face because he was not in on the campaign. The facts were that our competitor did so much business during the central station Federal campaign that he bulged clear out of his factory space and was building electric signs in the vacant lot adjacent to his factory. The electric sign permits showed his business was more than double that of the previous year. Similarly when the shoe was on the foot at Butte, Montana, and the central station was operating a campaign with a competitor and not with us, we found it easier to get business in Butte than ever before.

The reason for the conditions rests in the fact that load building devices are not a staple line. There is no demand unless it is stimulated. It is a specialty business that requires book-agent salesmanship.

Book-agent salesmanship costs money. Concerns handling lines that require this class of salesmanship cannot survive if the cost of goods exceeds 60 per cent of selling price if the goods are sold for cash and require no "after service" as we call it. They cannot survive if the cost of goods exceeds 50 per cent of selling price if the goods are sold on term payments and require no "after service." They cannot survive if the cost of goods exceeds 40 per cent of the selling price if the goods are sold on term payments and carry liability of "after service," such as free repairs, adjustments, or allowances. A patent potato peeler that the house-to house salesman sells your wife comes in the first or 60 per cent class, a phonograph or set of books comes in the second or 50 per cent class, and electrical devices mostly come in the third or 40 per cent class.

It is true, there is a very limited staple demand that can be met successfully by "over-the-counter" sales if the goods cost about 25 to 30 per cent more than the figures stated above. But that demand will never give the central stations the load their stockholders are entitled to see on their lines. No central station that depends on the staple demand to foster the sale of load building devices is tilling its field as it should be tilled.

But an electrical dealer cannot buy his goods at a sufficiently low price to permit book-agent salesmanship. Instead of an electrical dealer being able to get his goods at 40 per cent of selling price, the average cost of load building devices to the dealer or contractor is 65 to 70 per cent of the selling price. The margin is however sufficient to pay handling and sales cost in supplying this minute staple demand and this justifies the existing prices, and no claim is made that manufacturers should increase their discounts.

Consideration of these facts will show that it is better to have the central stations actively compete with dealers, since this increases the staple demand, than it is to have the central stations passively co-operate by withdrawing from activities.

The next thing is to show a plan of co-operation that will bring the results. It does not consist in financing the term payments. It does not consist in having central stations collect term payment accounts and turn the amounts collected over to the dealer. It does not consist in moral support or advertising "go to your dealer," etc. It does not consist in the central station buying advantageously and selling to the dealer at a better discount than the dealer could buy for himself nor does it consist in any combination of these. Advantageous as these are, they do not represent the solution.

The one and only solution is this: The central station should take the money that it would lose in its new business department if it sold devices, and distribute it as a bonus to electrical dealers proportionate to their load building activity.

First off you may say that a central station new business department does not lose any money and in reply I challenge anyone to show a report proving that fact. If anyone does, I will shoot it as full of holes as your committees do the reports of the success of municipal plants. The merchandising cannot properly be done except at a loss. The best merchants have tried it and failed. The best central stations have tried it and failed, but the central station can well afford to fail and conduct it at a loss, but a merchant cannot.

Next, you may say, how does it happen that the Federal Company has succeeded in merchandising load building devices without this bonus, and I reply that it is because our line carries a high gross profit and I receive definite central station co-operation so my "after service" and collection expenses are very small. A prominent vacuum cleaner dealer selling to consumers through several stores also succeeded because he bought his vacuum cleaners at 40 per cent of selling price, the criterion figure of success for this class of business.

There has been no success in the electrical merchandising field that violates these principles and if it is attempted to violate them the electrical industry will lapse into the sleepy state of those localities such as Tacoma that depend on the casual or staple demand only.

Now, face the fact that your load building is costing you three, four or six months estimated revenue and distribute that on a proper plan to the dealers who can show devices sold and in use. Then you will get results, and enthusiastic support and an element of good will for your company out among your consumers that is worth more than most any other asset.

If you cannot do this, stay in the load building device business with both feet since the fringes of your activity and the crumbs from your table will be bigger than anything the electrical dealers can develop by going it alone.

Chairman: Mr. Simpson has raised some interesting points in his paper. One of his points has to do with the cost of the goods. There are a number of manufacturers represented here. I am going to ask Mr. Booth of the Hotpoint Company, whose factories are nearby here, if he will not talk to us.

P. H. Booth: Mr. Chairman, the subject of 40 per cent has come up so suddenly that, at first glance, in these times of rising materials, it is apparently out of the question. But matters that are out of the question on first thought are not always out of the question on second thought, or on further consideration and study. So I would not say right now that we should throw down or eliminate the thought of some day being able to reach a greater gross profit for distributors. As Mr. Childs mentioned in his paper, there is a limit which the consumer will pay, and there is a limit to the cost of production, and if between these limits the 40 per cent comes in, we will be very glad to hand it out.

I think it is a great credit to the electrical industry, as a whole, that it is so broad-minded as to take in every branch of the industry so as to discuss problems of this kind as broadly and as fair-mindedly as we have in the meetings yesterday and today. It is certainly a great credit to the caliber of the men interested in the electrical industry.

The part that the manufacturer plays is one where we are all interested with you, and we must live, as the central station must live, and the dealer must live, and the jobber must live. We all have the same object in mind to obtain—a fair profit on the work we put forth—goods we deliver must be goods that represent a fair price to the consumer and a fair value to the consumer. Therefore, in view of the broad-minded attitude with which we are approaching the problem, its solution is near, as I see it, and it is nearer than it ever was. It is a great comfort to feel we have this problem outlined before us, and I am sure much good will come from a careful analysis of it.

It was not long ago that we heard the familiar phrase "competition is the life of trade." On this basis, the legal department of the government of the United States used to work most aggressively to bring about competition in the various industries and in the various public utilities. Today, they have been brought to realize the folly of an extended intensive competitive condition. This is an age where "co-operation is the life of trade" instead of competition. This spirit of co-operation to augment and build up the endeavors of the industries of the country, has been legalized by the various departments of the government and makes possible associations of manufacturers with their dealers and their clients, such as this association. Furthermore, the government accepts the legality of these associations, feeling that with this friendly spirit of co-operation, industries are encouraged, fostered and built up much more rapidly and much more substantially than if the former policy of intense competition prevailed.

I think that a great many of those present did not give as much serious consideration to the meat in Mr. Childs' him and discussed by the committee, the various angles of the merchandising situation were gone into carefully, and Mr. Childs has tried to present to you a concrete line-up of this problem and the various elements that go into it. I am sure that Mr. Wall's idea of publicity plays a very important part, and Mr. Childs touched upon this in his paper, that first must come the publicity, the desire to buy, and then comes the resulting problem of how that demand should be satisfied. The question of the solution of the problem is one that will undoubtedly come soon, but the solution will not come definitely, as I see it, all of a sudden.

In solving a problem, as concrete, and yet as complicated as this is, we must naturally take into consideration the personal element, the personal equation of the component parts of the problem that must be solved. This personal equation will vary greatly (as has been pointed out today) in the various districts, towns and companies, including the central station, jobber and dealer, in which the problem presents itself. But by bearing in mind, as Mr. Harris has said, that we must live and let live, at the same time, considering the personal equation that has to be contended with, I am sure that the solution will be worked out. It may be a little different in the various parts of each locality, but with all minds working together, with one object in view—to increase the sale of appliances, thus increasing the revenue for the central station, dealer, jobber and manufacturer—much good will come from the united effort.

Chairman: I wish we could have the time to hear from all of those in the room who are prepared and inclined to speak on this subject. I am going to ask one other manufacturer to discuss this point raised by Mr. Simpson. I think Mr. Alvord of the General Electric Company is qualified to discuss this for a few minutes.

R. M. Alvord: Mr. Chairman and gentlemen—This quesquestion of co-operation between the central stations and jobbers, manufacturers, and dealers, is one that has interested me for several years. I have a suggestion to offer for your consideration in connection with a point mentioned in Mr. Simpson's paper: The Society for Electrical Development has done a great work nationally in co-operative advertising and publicity. The points that have been brought out by your discussions here show that we need to do a lot of work locally to assist in creating a demand for the use of electrical devices and that we must help the national campaigns to educate the housewife, her husband and all the children to use electrical appliances. We must make them want and want very much to "Do it Electrically."

I believe that the money which Mr. Simpson suggested might be supplied to contractors and dealers as bonuses, would secure the greatest results if it were spent in a co-operative movement confined to the territory of this section of the National Electric Light Association, I believe all will agree that a certain amount of money used for co-operative publicity will be more effective in salesbuilding than it possibly could be when divided into individual bonuses resulting in scattered and more or less ineffective efforts.

Very few of the dealers have the advantage of advertising experts in their organizations—a co-operative organization may command the best, and then there is a decided advantage in the larger purchasing power effected by the co-operative plan. I therefore favor the co-operative way.

The expenditure of this fund should be under the direction of a joint committee consisting of the commercial committee of the National Electric Light Association and of a committee from the Contractors' Association. The work undertaken might include general co-operative advertising paid for from the fund—the stimulation of local co-operative sales and advertising campaigns, the distribution of educational newspaper articles and, most important, encouragement and assistance to dealers and central station men in their efforts to study and become more effective merchandisers. This work may be made general for the states in this geographic section,

or at the discretion of the committee it could be localized, depending on conditions in northern and southern California, in Arizona, Nevada and New Mexico.

Chairman: Mr. Alvord, before you finish, will you discuss the percentage of gross profit matter from your point of view?

R. M. Alvord: Yes. There is one other point that I think is worth consideration by the central station. I am vitally interested and feel that the dealers must believe, and the jobbers, that we are all dependent to a large extent on the success of the central station, and the growth of their business It means bread and butter to all of us.

There are, as Mr. Berry pointed out, some three thousand electrical contractors and dealers on the Pacific Coast. It is possible to make every one of these contractors and dealers a more active efficient salesman for the central station industry, and for our industry as a whole.

The National Electric Light Association has spent a great deal of money, and the commercial section has spent a great deal of time in developing sales training courses—a correspondence school in salesmanship. Why not go a little further and extend the benefit of that course, training in salesmanship, to all the dealers and contractors? The fact that they are here with you today indicates their desire to co-operate with you, and I am sure they would be glad, many of them, to take advantage of an opportunity of studying that course in salesmanship and merchandising.

Mr. Walton has asked me to speak on the subject of dealers gross profit on appliances. I am not in a position to say very much to you regarding it. Mr. Childs in his excellent paper, Mr. Booth and others before me, have suggested a need of careful study of retail prices and dealers gross profits. I agree that there is a limit to the retail price which can be secured. There is also a limit below which it is difficult to manufacture. I believe, however, that the question of the price at which appliances can be sold to the consumer and the difficulty of getting a proper price, is sometimes given too much consideration. I believe that with quality goods, right merchandising methods and good salesmanship, devices can be sold to the consumer at a price which will allow a fair profit to all sections of the industry, and that those prices would not be so high but what we could be confident in our own minds that in selling at those prices we are doing our customers a real service.

If we thoroughly know our goods and the services that they render to the housewife we will be enthusiastic about the value of our electrical appliances, and fair prices will seem low or at least reasonable to us. Then with ability as salesmen we can convey that state of enthusiasm into our customers' minds and they too, will want to "Do it Electrically"—will want the appliances we offer and will feel that our prices are reasonable. Therefore, I recommend that all of us and all our associates in the industry use more ourselves the services and the appliances that we are trying to sell to others, and also that we take advantage of every opportunity to improve our skill as salesmen. The first will give us a greater appreciation of the value of electric service and will minimize the question of price. The second will increase our power to make others want—very much—to "Do it Electrically."

Chairman: Is Mr. Woodill of Woodill, Hulse Company of Los Angeles here?

H. B. Woodill: I believe we are entirely too timid about the profit idea. I have listened to Mr. Simpson's paper with a great deal of interest. I can recall a few years ago when the manufacturers thought it was impossible to allow the dealers over a dollar profit on each fan sold, and then he had to contract for a number to even make that much. They have changed that now and are allowing us a little better margin.

If you will look over the commercial ratings in your financial reports as to the merchants who are sccessful in the different lines, you will find that the hardware merchants very seldom fail, and the druggist never, because he makes a large margin of profit. This cannot be done unless the profit will take care of the overhead and a balance besides.

I can readily see where the manufacturers who have sold through the lighting companies hesitate about increasing the prices. He made his manufacturer's profit and sold his output to the lighting companies and it was therefore nothing to him whether they sold it at a profit or gave it away. They also took refuge behind the fact when we went to them that the entire matter was handled by the lighting companies and that they were powerless to change it. This is different now, thanks to the lighting companies gradually changing attitude, and I believe if the lighting companies assist, the dealer will take up the white man's burden and push the sale of appliances even better than they could.

If you will look back over the past ten years you will find that most all electrical dealers have failed. One reason because he was not a business man and sufficiently educated in business methods, the other was, and the principal reason—that the margin of profit was not large enough. It used to be that let an electrical salesman go to a department store and offer to sell them goods, they laughed at him and said they did not care to handle that sort of merchandise, as the margin of profit was not sufficient. We are endeavoring to install department store methods in our business, and with that idea in view, following in the footsteps of some other large dealers, we are taking up the sale of all appliances on the installment plan. It is for that reason of great interest to me to hear of a man in Salt Lake who sold so many washing machines. Los Angeles is in a particularly good position to take the burden of the sale of current-consuming devices off the hands of the lighting companies, as we have a half dozen or more thoroughly up-to-date retail electrical stores, and therefore are in a position to sell all the appliances there is a demand for, and I think in a more satisfactory manner than the companies' own department for handling this class of business.

Chairman: It would not be right to close this meeting when we are discussing merchandising, without hearing from Mr. Scobey. Mr. Scobey is the proprietor of the "Home Electrical" in San Francisco.

M. L. Scobey: I was much interested to note the remarks of the central station operators here, in that they are commencing to recognize the ability of the dealer. Three or four years ago the contractor and dealer was not thought very much of, and rightly, because the central station at that time was selling goods at their cost, which was probably lower than the cost to the contractor or the dealer. Today they have changed their minds. They realize that the contractor and dealer has become a better business man, that he has learned more of business methods, and is in a position to carry on the sale of socket devices, as well as other electrical devices.

The central station does not fully realize what the contractor-dealer can mean to them in the future. We have come down here to ask for your support, that you place a little more confidence in the contractor-dealer than you have in the past. I believe we can show that we can give you results, and eventually take the burden of merchandising the socket devices, lamps, and so forth, entirely off your hands and give you results that will be plain and readily seen on your books.

Practically all the electrical dealers and contractors are members of the state association, and meet at least once a month, and locally every week, to discuss the problems of contracting and merchandising.

Selling to women is one of the problems that has been vital to the dealer. Perhaps 85 per cent of the socket current devices are purchased by women. The electrical dealer now has a store, that invites the women's patronage. Two or three years ago that was not the case, as the contractor-

dealer could not afford to put the time, money and effort into a stock of these devices, which today he can. And I think you will agree with me that the store of the contractor-dealer today is one that is worthy and has a place in the business world.

A woman coming into the store to buy a lamp doubtless sees numerous devices that she is interested in. She makes inquiries. We take particular pains to see that our sales people are posted on all of the devices. She can get accurate information regarding any device she may see, and while she may not purchase that device when she has in mind the purchase of a lamp, the seed is planted in her mind that there is such a device and eventually she purchases it.

With the support, good will and confidence of the central stations throughout the Pacific Coast section we can show that we are on a firm business foundation, that we are capable of carrying on the merchandising end of the business, and I hope that some means will be arrived at, as suggested by Mr. Alvord, whereby the central station, the manufacturer, and the jobber and dealer can get together or some real publicity campaign which will be of benefit to everybody concerned.

As far as the bonus proposition that was put into effect by the Pacific Gas & Electric Company is concerned, the dealers unanimously voted that they did not care for the fifty cents per socket device that was sold; they would be more than glad to take that fifty cents and put it in a fund, and if necessary, add another twenty-five cents from their own pocket so they could have a fund that would be worth while, and a great publicity campaign could be carried on under the auspices of the Pacific Gas & Electric Company, who, at that time, were the only ones putting such a bonus campaign in effect.

C. F. Butte: The whole question simmers down to four things; education, enthusiasm, publicity and co-operation.

The story of the five-year-old child is somewhat opportune. The contractor and dealer is the five-year-old child. The five cents is the merchandising problem in the profits derived from the merchandise and materials. Father is the central station man, and in the past has held the merchandising of materials and has not given the dealer the opportunity to earn the profits. The contractor-dealer is using the method of the five-year-old child in getting the five cents. Father will say today, "No, you can't have five cents." He will tell the child tomorrow, you can't have five cents, but that child will get the five cents even if he has to put his arms around your neck when you are sitting in your rocking chair and kiss you on your lips and say, "Pa, let me have five cents, please, dear." And he will get it. (Applause.)

The contractor-dealer has been educated to the point of knowing how to ask for the five cents, keep it and spend it. The process of education has been going on for the last ten years, and we have reached the point of knowing how to merchandise.

The enthusiasm and interest shown in the contractors' car in the special train from San Francisco was not merely getting 28 hours out of 24 for the purpose of enjoyment. There were problems discussed that could not have been discussed under any other conditions, as we had central station representatives, jobbers, manufacturers, and contractor-dealers aboard in good number. We could not get away from one another, and we had to sit there and discuss the problems. We have thoroughly demonstrated in this convention that we mean business, we are enthusiastic, and that we have interest, and we cannot maintain any of them unless we have some money to spend to keep it up.

The publicity: I think you can't deny the fact that every contractor and dealer depends absolutely on what he sells Whether it is in the shape of appliances or whether it is in the shape of material installed, it is merchandise. We have three to four thousand individuals interested in that one problem. We have possibly thirty or forty thousand directly dependent upon the profit from the sale of merchandise. The central station, on the other hand, is interested in selling the appliances not for the profit in the merchandise, but for the profit in the consumption of the current that that merchandise will use.

We therefore ask that the central station maintain a legitimate price in the selling of electrical appliances,—a price based on the first cost plus the overhead expense plus a fair return on the investment. In return for the maintenance of a legitimate selling price we will be in a position to advertise, introduce and develop the use of electrical appliances, capitalize the publicity that can be had from thirty or forty thousand individuals, direct our efforts to mutual advantage and aid in the formation of public opinion. Is there any limitation to the benefits the central stations can have and can get, if we have three or four thousand successful contractors and dealers?

The contractors can help build good will for the central station. The contractor-dealer is daily meeting all classes of consumers and prospects, daily meeting problems never brought before the central stations, daily coming in personal contact with the consuming public and can lend material assistance towards the formation of public opinion and good will. However, it must be borne in mind that the contractor dealers must be met by the central station not as an aggressive competitor in selling apparatus or material but as an institution doing business in all its branches on business lines.

K. E. Van Kuran (contributed): A number of central stations have been marketing appliances at a reduced price. the chief reason being that it was necessary to make a special price to introduce these appliances in the homes of the consumers. We have carefully checked this problem and find that from our experience in central station campaigns that as many appliances can be sold at the retail price as at a reduced or special figure. This experience is borne out by campaigns which we have run in Denver, in some of our Pacific Coast cities, and in a large number of cities in the East. We do, however, believe that some form of time payments is of a great deal of assistance in putting appliances on the lines of the central station, but that reduced prices do not tend to appreciation of quality in appliances. Mr. Childs, in his paper, stated that the special prices are necessary in order to interest the consumer in the initial purchase and to dispose of a sufficient quantity to establish the lamp socket appliance as a permanent household necessity. We believe that the time payment is of a great deal of assistance in such work, but that the reduced price is not necessary and that as many appliances will be sold as at the cut price. We believe further that the higher price means a larger margin to the central station to permit of the employment of scientifically trained and well organized salesmen to sell this apparatus and that the resultant load on the lines of the central staton will be increased by such action. Further, that while the central station will increase the load on their lines by this method, they will at the same time sell at the same price as the dealer or contractor, and again enable him to sell more and more lamp socket appliances.

H. C. Reid: I am another one of the contractors from San Francisco. (Applause.) We accepted with a great deal of pleasure the invitation to become associate members in your organization, and consequently are here today, sitting in your meeting, studying and thinking about your problems, presenting to you some of our problems, and asking that when this convention breaks up and you go back to your respective businesses, that you will remember the contractor-dealer, and at the next annual convention we will have solutions to present and reports to make to show that the subject has been well thought of and well handled.

Mr. Bibbins said that we are the nerves in the finger tips of the industry. And I think you will all readily appreciate that we are the ones that go out, we meet the public in the highways and the by-ways, in ways that possibly the

central station representative does not meet it. We are the ones who help mould the opinion of the architect, and the engineer, and the prospective home builder. We help to stimulate your growth and your use of electricity in that manner, even though we do not have nice show windows on the main streets of your city, even though our office may be in an office building, still we are helping to mould public opinion, which is all for the betterment and the increase of the electrical industry.

We all appreciate immensely the privilege of being here with you today; that we are going to take back with us and distribute in our association meetings the problem of the extension of the electrical industry, the further co-operation with you central station men. I thank you. (Applause.)

Chairman: Gentlemen—Mr. Halloran has a few direct conclusions on this subject of merchandising. He has given the subject of co-operative merchandising a great deal of study over a number of years. He has not heard the discussion this morning, and does not know in reading his paper that his suggestions and conclusions are in direct line with our discussions. I know you will be interested in hearing what Mr. Halloran has to suggest as the definite beginning of the solution of this problem.

A. H. Halloran: The following plan for co-operative merchandising by the central stations and the dealers is submitted as a practical means for bringing the results suggested in the commercial committee's report and as a satisfactory solution for both parties to the arrangement. It is based upon the thought that each dealer should be constituted an accredited representative of the central station in his territory, and yet be independent in conducting his own business. It carries the further intention that the central station should control the sale of all appliances that go on its lines. It is somewhat the same plan as that whereby the drug store acts as a sub-postoffice, with the exception that while the druggist received no direct profit from the sale of stamps, the dealer will make not only the regular profit from the sale of electrical devices, but will also receive on each device further assistance from the central station in proportion to his value to the central station.

The idea is to intensively localize the central station's sales efforts,—to bring the electric power company to each consumer in his own neighborhood, instead of the consumer's having to go to the electrical company's central office. Let the dealer be authorized to receipt bills, receive and transmit, but not adjust complaints, sign contracts for electric service and perform other functions of commercial agents.

Let the personal solicitation for appliance business, the personal letters, the newspaper advertising, the circulars and the show window and store demonstrations be carried on jointly in the names of the dealer and the central station, but under strict central station supervision.

For the intelligent prosecution of this plan, a central bureau will be necessary to plan campaigns, prepare or procure booklets and circulars, advise on window and store display, write advertisements, and educate and train salesmen, supplying competent help to the dealers as needed. A large part of this task has already been anticipated by the commercial section N. E. L. A. and the Society for Electrical Development, but even their literature and campaigns should be adapted for local use and supplemented by a knowledge of the peculiar conditions of this territory.

This bureau service should be at the disposal of central station members who conduct their own merchandising campaigns, as well as such dealers as may qualify.

To qualify as a licensed dealer, a firm should be a member of a recognized association of electrical contractors and dealers. Such an association should include in its membership not only electrical contractors, but also hardware men, department stores, drug stores and any other establishments selling electrical appliances. Within a year's time every dealer's salesmen should have satisfactorily completed a course in electrical salesmanship and only such salespeople as can show a certificate to this effect should be employed by licensed dealers, to sell electrical appliances.

The details of this plan, as thus roughly outlined, should be worked out by the commercial committee of this section. It should determine the character of assistance from the central stations, the means for reporting sales and collections, the proper field and office men to organize and conduct the campaign, the specific qualifications of licensed dealers and the amount of money needed from central stations and jobbers to effectively and economically carry on the work for the next year.

This plan is submitted in the hope that it will start discussion and action which will ultimately put more business on the central station's lines, provide sufficient incentive for greater activity by the dealers and ultimately bring about better public relations, when every man in the electrical industry is working toward a common purpose, "each for all and all for each."

(An adjournment was thereupon taken until afternoon).

Chairman: I think Mr. Bennett of San Francisco, contractor and dealer, has prepared a paper or has some discussion prepared that he would like to bring out at this time. Mr. Tom Bennett.

T. J. Bennett: I am satisfied that after our arguments this morning, we have convinced the central stations that they should not be in the business of retailing heating devices.

Now, I am going to talk from the contractors' standpoint. It is my candid opinion that the financial efficiency experts of public service corporations are very lax. They are giving away something for nothing. They should arrange a definite distinction between the work done by the contractor and that done by the power company. I have the services particularly in mind. The underground service should stop at the bulk-head; an overhead service should be brought to the conduit that is installed on the outside of the building. and a pole riser service should be brought to the secondary arm and no further. In San Francisco there are buildings with three or four thousand dollars' worth of unused feeds and services in the basement. Some buildings have services from three companies while only one is actually supplying current.

Such a definite distinction would not limit the installations nor increase the cost, but the property owner would pay for it. The architects would be informed by a central station representative. "Here is our service point, here is where we stop; that is where the electrical contractor begins." The water companies have a place to stop. A plumber figures a job to the curb line.

The contractors can do this work more reasonably than the companies. The companies should not be in the contracting business, which requires the individual attention of the contractor. I have never seen an electrical contractor yet who could leave his business to somebody else and have it attended to. It is a business, a business all in itself, and I don't see how these service corporations can afford to do that kind of work.

As to the ranges, there has been a great deal of argument as to who shall sell and install the range wiring. As far as any contractor is concerned, we don't care who sells the ranges, but I really think we should do the wiring for the ranges. Many times the companies have said that they would sell the ranges and would give a portion of the installation price. Now, I think that if they went to the consumer in a different way, they could do more business; that is, by going to him and telling him that if he wires his house for a range according to the lines that are necessary, they would give him a range for nothing. It practically amounts to the same thing. I think they would sell a good many more ranges.

The central stations have also brought out the point that the contractor does not pay attention to the business when he secures a range installation. I do think that the central stations have not gone into this matter far enough. If they gave an order to a contractor who did not attend to it within four or five days, he is not an electrical contractor. Any contractor in San Francisco would start a job in a couple of hours. I think if the company would look into it, they would find they were waiting four or five days for the general routine of procedure to go through the company in order that they might get the necessary order to go ahead and do this job.

If the central station gave the contractor all work inside of the building they not only would get out of installing this work, but could also cut down their crew and equipment. The contractor could do that work better and make some money out of it. But, as I say, they are giving it away. I would like to see this proposition brought up before the efficiency committee to make a definite ruling on this subject, a report made and that the contractors be consulted on the proposition.

Chairman: I think that while the points brought out by Mr. Bennett are pertinent in our general discussion of commercial problems, they hardly really take the place in the discussion of the merchandising in the sense we have been discussing Mr. Childs' paper.

Mr. Bennett, I think, the points you have raised are possibly more local. I believe that if a committee of your local section in San Francisco, for instance, would put them up to the companies interested in San Francisco, you would get along further and possibly faster than by discussing it before the convention here.

C. H. Paulin: The question of wiring or the installing of the electric range by the electrical contractor has been raised several times. There is a question in my mind as to whether or not this is the proper method of handling this "at the present time." Understand me, I emphasize the "present time." This is on account of the fact that the outlying districts not within the city limits of any town, do not have an inspection system other than that of the central stations themselves. I have in mind several instances of where faulty installations were made and it became necessary to tear them out and do the work over. In one particular case wiring was in conduit, and partially underground work.

It is my opinion therefore that at the present time this work should be done by the central stations. Understand I lay emphasis on my former statement "at the present time." I am not prepared to state whether or not the central station should continue this policy indefinitely or not.

Since the electric range is at the present time in its infancy, I believe it behooves us all to see that every installation is made as near as possible an ideal installation, one that assists in making the electric range stick. All this for the reason that the future of the electric range depends absolutely on the number of successful installations we put in at the present time.

John A. Britton: Mr. Chairman and gentlemen—I think a word might be said in reply to the contractors with respect to the interference with their work, and their profit necessarily, by the distributing companies. You have to go back a little in history to really comprehend just why the power companies are undertaking to do the work they are doing now. None of them are doing it because they want to do it, or because they believe they can do it any better than the contractor, but it becomes absolutely an economic question which, from the very first inception of the introduction of appliances for any purposes other than lighting, going back to the gas game, became necessary when gas stoves were first introduced,—that is not so very long ago, either. The company had to take the initiative in all matters of merchandising and of connections, from the economic standpoint of the distributing company, to be sure that the service it is giving will be responsible and reliable.

When the electric appliances first began to attract notice, —that is not so very long ago, either,—the same conditions arose. You can't provoke a disposition on the part of consumers to use your commodity unless you will do as any other merchandising firm will do, make it easy for the consumer to get it, and the greatest deterrent today, and the greatest deterrent we have had in all of our experience, has been the cost.

It became essential in the introduction of gas stoves to give away gas stoves to consumers, do all the piping free of charge, and to make a differential in the rate between lighting and the use of gas for cooking purposes. Even with all of that, it became a difficult thing to displace the then existing appliances for the purposes for which gas was applicable, and that is identically true today in electrical appliances. The consumer is suspicious of the first cost; he is suspicious always of what it is going to cost him afterwards, and he is suspicious of the service he is going to get.

The power companies, in my judgment, are justified in every respect in adhering to their rule generally that they must install these appliances, because the average contractor does not do his work properly. I speak from the heart. We have contractors who do, who have respect for their positions, and respect for the patrons with whom they deal. But the average electrical contractor has not become a stable quantity in our community until very lately, and is not yet very responsible. The burden is upon the power company the moment the installation is made. The contractor, when he gets his money, is through with this trouble. We have to follow up every day and every night the complaints of the consumers, and it behooves us to see that the installation is so made that we can guarantee the service we are responsible for.

Now, I take it that the merchandising of appliances and creating and provoking additional sales is just as much a part the business of the electric company as is the generation and the distribution of the energy it supplies. I can't draw the line between the two. I am mindful of the responsibilities on contractors, and their investment of capital, and their desire to do work and to make their profit upon it, but I can't draw the line between them and ourselves when we have the demand for the service and the responsibility for it afterwards. We made no headway at all in trying to introduce electrical appliances, and we would have made no headway until we did actively do the work that we were required to do, for this reason, to go back to the principal and fundamental principle of it. That is the economic condition.

If we were to charge a consumer desiring an electric range the price of the range, plus the overhead and the profit that a contractor usually makes on the sales of his appliances, and charge him then with the cost of connection, we would not have any electric ranges in use. Nothing would kill that game more readily and more easily than to leave the question of the sale of the range and its connection to contractors. We can afford to do it for the resultant profit that comes to us in the end. We can't afford to do it as simply an immediate proposition, any more than we can afford to advertise, as we do in our company, to the extent probably of a hundred thousand dollars a year, and we can't do it any more than we can afford to do other things we do if it were not for what the future will bring the company.

The time will come when the contractor will find his appliance business is on an economic basis. And if we can require the contractors to give the most effective service to us, you will find the power men perfectly willing to turn over to the contractor all that belongs to him.

I believe, to touch upon the other point that was spoken of by Mr. Bennett, that there ought to be a line drawn where

the power companies will not invade the consumer's premises, but you have to accept the condition as it is, gentlemen. We are in very severe competition in practically all of our territory, with the exception of a few small towns where competition would not pay, and I do not think we can help doing the things we are now required to do, because if we do not, we will lose the business, and I am not sure that any arrangement could be made as between competing companies as to where they would agree to any such thing. If they could, as Mr. Walton well suggested, that is a local matter that ought to be taken up with the managers of the competing companies in the districts involved and see if that particular point can't be settled. We are deprecating very strongly in my company the putting in of any electrical apparatus in the consumer's premises. In places where we have no competition, I will not allow it. But I can't sit by and see business go to the other companies. So that becomes purely local.

Now, as to the question of merchandising, I believe so far as the power companies are concerned, they are the natural avenue by which merchandising should be done to the consumer. But in saying that, I don't want to dismiss the dealer and contractor. I believe there is a middle ground where the power companies, anxious to protect themselves, can deal with the dealer and contractor and give him an opportunity of doing business under our direction. I think we are approaching that point very rapidly. I think the dealers and contractors in our districts will agree that help in the last year or more has been given to them such as they have never expected to be given. Some of our plans did not work out, as the contractors and dealers and jobbers here know. I think I would not limit the bonuses, but would give aid in every respect to the dealers and contractors to help them get the business, and intend to still further increase that aid as far as I am personally concerned.

But I can't help but say again to emphasize that, that all of these matters of merchandising, as between the dealer and contractor and the power company, are altogether of a local nature. I do not see how the several companies here associated could sit down together and agree upon a policy. I am sure I would not try to dictate to Albuquerque, Phoenix, or Seattle. I don't think the dealers and contractors would expect an organization of this kind to undertake that kind of work.

But I do believe that with the spirit that pervades the power companies today, that the dealers and contractors, if they don't want too much out of the game, can make arrangements with the local concerns to meet them more than half way so they will get what rightfully belongs to them. And I hope and expect that all of the member companies will receive that same character of co-operaton from contractors that we are getting in our districts. I realize all of this little turmoil of differences as between ourselves could be eradicated if Mr. Bennett and Mr. Butte would agree to get Mr. Briggs or Mr. Fleishacker to sit down with me in my office, and we could probably decide that question in a half an hour. But I am not going to initiate it and Mr. Briggs is not going to initiate it. We are bound by rules and regulations, and we are bound to protect the investments put in our charge, to make money for the stockholders. I think we are making it legitimately.

We are not trying to force anybody out of business; that is a false idea, and the sooner the contractor gets that out of his mind, the better it will be, because we don't do in that respect any differently from what any other merchandising concern does. They all give things away. Why, I was at a banquet the other night attended by 350 manufacturers where they gave away goods of their own manufacture representing at least a total of two or three thousand dollars.

Now, if we have to get the business we are striving for, to make business better and stronger every day, we have to give those things away from time to time. We have to sell things below cost to encourage their use, because the greater development we make of the useful things that come into our business, the better in the future will be the demand on you for that business, because we have paved the way and ironed out all the difficulties in your business, and you are the ones that are going to benefit and not ourselves. Thank you. (Applause.)

H. P. Stow: My understanding is that the central stations do not want this business, that they have been forced into it as a protection to themselves. The manufacturer of anything does not want to retail it; he wants to wholesale it. And to my mind, the central stations simply are manufacturers. They are just a branch of the manufacturing part of the industry. The electrical contractors and dealers appear to be one and the same thing, and they are the salesmen.

The salesman, I find, in a mercantile business, thinks he is the most important man in the business. Everybody else does not agree with him; personally, I do. I think the salesman is the fellow that is bringing in the almighty dollar, and that is what we are all after; he is the fellow that brings the jingle into the pocket, and it seems to me that the contractors and dealers are the men who do the selling. My attitude towards the salesman is not that he is the finger tips of the industry, but that he is the heart of the industry, and I make the salesman believe it, and I put him up on a pedestal. He is not an overhead from my standpoint; he is a producer; he produces the most important part of the work of any industry; he sells the goods.

I have gone down through this country, talking to the dealers that deal in my class of goods, lighting fixtures, and in all of the towns they are also dealers in electrical appliances, and there are the contractors that go out and wire the houses, and so on. Whenever I have found a high class electrical contractor and dealer, I have found that he is getting the support of the central station. He frequently is a man that has worked as a lineman. They have tried him out and know he is a good man, and they are giving him all of this selling business. I think that is where it belongs. I don't believe that Mr. Butte and Mr. Bennett will have any trouble to get in touch with Mr. Britton in San Francisco, or any of you who come in contact with his company. I don't believe you will have any trouble if you can show him that you will play the game fair and square, and get all the help and all the assistance that you require.

I might say one word about conventions of this character. They represent the brains of the body. They start the ideas going and they bring men together, in order to swap ideas and I say make of a competitor a friend. Tell him your troubles, and go further and tell him your secrets; get his confidence, and he will tell you his troubles and tell you his secrets. You will find that he knows your secrets already, so you might just as well own up and tell them to him. He will help you solve your problems. I think that the oftener you meet and the more you discuss these things, in spite of the chairman, bring it out even though you do get off the subject of commercialism a little bit. You are going to be benefitted by such discussions. You have had statements made to you by Mr. Britton that were not exactly commercialism, but it is going to help you all, and eventually it is going to help him.

S. M. Kennedy: I might say a word or two on this subject if I had the opportunity. Mr. Stow has just referred to telling each other our secrets, and he has given a good reason therefor. However, there is one matter that I have not heard touched on, and that I would like to bring out from the standpoint of what I know in reference to the desires of some of the larger electric companies.

The companies represented here are not what we call philanthropists; that is, not when you get down to close quarters. We may be public utilities and have a desire to serve the public, but we must also protect and serve our stockholders. Now, there is a burden put upon those who have charge of the electric companies to develop their busi-

ness. There is a responsibility in connection with that development which means that we must get out of every dollar of investment as big a return as we are allowed to earn. If we don't exert ourselves, if we don't keep at it all the time, if we don't follow up every groove and work every channel, we are not doing our duty. We are not doing our duty to ourselves, that is, to the company, to our stockholders, or to our consumers, and that means also to the contractor and to the jobber.

Now, the particular secret I want to tell you today, and I am speaking now particularly to the jobbers and contractors, is that in my opinion all that the central station should have to do with its customers—I say should have to do—is in the way of making collections, collecting money for service rendered. We do not want to be bothered with the work of collecting money for wiring, for appliances, and for any other kind of service that can be done by anybody else. It is sometimes a difficult thing in dealing with our customers to get our own bills paid—I mean the bills for service—and often our customers will impose upon us if we are selling them appliances, or having them paying for installations of any kind, saying, "Oh well, we are paying you for the power bills, and we will have you let the other float along for a little while."

Now, we can't get along without money, we need the income, and if we are doing work in the ordinary way of selling appliances, it needs to be paid for. Consequently we are at a disadvantage in that respect, and for that one reason in particular I would like to see all of the contracting work, all of the selling of appliances, turned over to those who can handle it better. But we have this duty and we must live up to it. Mr. Britton has explained very forcibly what we can do, and he has stated some of the things we can't do. And I want to tell you that we are progressing. Some fifteen or sixteen years ago when I came into this business, my company was doing wiring. We used to buy fixtures from Mr. Day up in San Francisco; he was a manufacturer; and we used to sell those fixtures, and we used to have to collect for them. We also had other contracting work which we found it necessary to do—even regular house wiring. That day has passed. Then came along the electrical appliance business, and we found that would be a most valuable adjunct if we could get a load that might be developed by such appliances. We found that we needed that load in order to build up our system, in order to develop our load factors, and in order to be able to sell energy at lower prices so that you, the contractors, would benefit as well as ourselves, and that the public would more generally use electricity for lighting, heating and power purposes.

That stage has passed, and gradually—I am speaking now particularly of the Southern California Edison Company—we are dropping out of the appliance business. One of my assistants said to me the other day, "Mr. Kennedy, do you know our appliance sales have fallen off between two and three thousand appliances for the first three months of this year?" I said to him, "I am glad of it." Because I had learned from outside sources that the dealers and the contractors were selling more than ever before.

I find that we today do a certain amount of work in the development of the electric cooking business. It is new; it is experimental, as far as the wiring is concerned. We have had to change the method of installing to what we did in the first place. It is new, but while it is new, it wants to be done right, because as has been stated here in this meeting, if it is not done right, then the electric company is going to have an endless amount of trouble, and if it is not done right the consumer is going to be dissatisfied, and the good work that has been done may be all undone if the installation is not made along proper lines.

I want to tell you gentlemen that the electric companies, as a whole, are ready and willing to get out of the electric contracting and out of the appliance selling, and all that, if they could feel that the work is going to be done as well by other means. Now, I have felt that that time is coming. With reference to certain kinds of appliances, and installations, it has come and gone. Today, when we make motor sales for power installations in the country and in the cities, we don't bother about the motors; we don't do the installation unless it is in some localities where the contractors either are not available or do not do the right kind of work. We want to get rid of it. We are glad to sell power and let somebody else make the installation. Formerly we used to sell every motor ourselves, and make every installation. We are progressing and the time is coming that you contractors and dealers are looking for. But you must recognize that today we are helping you build up your business for the future, and if we don't break the ground, if we don't develop this particular business which is profitable to the companies, and equally profitable to the jobbers later on, nobody else would do it.

G. E. Arbogast: It seems to me that the central station constitutes the hub of the electrical industry and that the manufacturer and jobber really follow in the wake of the development created by the central station. Their combined and ultimate object is to reach the consumer, but in the attainment of their desire, they have overlooked the importance of the contractor and dealer. Heretofore they have considered him from the wiring standpoint only, which the central station was forced to give up years ago for economic reasons.

Dealers are often not given the consideration that merchants receive in other lines. There are many reasons perhaps why the average electrical contractor does not become a merchant. More often than not he graduates from the tool bag and is forced to enter upon his venture without adequate financial assistance. Should the central station give aid in this direction, or at least create an incentive through proper and close co-operation, the wiring contractor would develop rapidly into a merchant as well.

Did you ever seriously consider the fact that every community in the larger cities, has its electrical contractor who is not only able, but does, perform the service required of him in his line in that particular neighborhood. It is logical to assume therefore, that the majority of families residing in his vicinity are personal friends. We have been told that eventually the drug store, grocery store and the hardware store will distribute electrical appliances and lamps, due primarily to the fact that they are located in the residential districts, and therefore, in a position to satisfy the wants of the people on short demand. Would it not be better, from the standpoint of service to the public, as well as the central station, for the electrical contractor in each community to open a small store for the distribution of electrical appliances in connection with his contracting business?

Do the central stations realize the progress made by the electrical contractors and dealers throughout the Pacific Coast during the past few years? At the present time we are thoroughly organized in every state. In Southern California we have an organization of over fifty members, known as the Southern California Electrical Contractors and Dealers. Our work, which is along educational lines, is not only with the contractor and dealer, but we are endeavoring as well to educate the public in the uses of electricity. This is being accomplished in many ways; largely however, by preparing specifications and plans for the original wiring installations through the architect and builder, and by co-operative advertising on the part of the dealers.

We have also been successful along legislative lines which has resulted in the past year in the enactment by the city council of Los Angeles of a conduit ordinance which makes it necessary for all wiring within the city to be installed in rigid iron conduit. Also an ordinance of registration, which requires a deposit of $50 before a permit can be taken out for the installation of electrical work, whether it be installation of electrical wiring or fixtures. Both ordinances un-

doubtedly have important bearing on the business in Los Angeles. The first, will to a large extent raise the standard and character of the work done, and the second in a measure will define who shall do the work.

Before closing, allow me to impress upon you the importance of closer and broader co-operation on the part of the central station, manufacturer and jobber, with the electrical contractor and dealer, to the end that he may not only serve the public as an electrical contractor, but that of a merchant in distribution of goods and appliances as well.

J. W. Redpath: The general trend of the discussion seems to be along the line of co-operation and get-together for bigger and better work. It has just occurred to me that possibly in our haste before luncheon we overlooked one of the most important papers that has been presented to us, that presented by our secretary, Mr. Halloran, which has co-operation and united action for its keynote. In view of that, I wish to make a motion at this time, that that paper be referred to the commercial committee for its careful consideration, and such action as it may deem proper to take.

Chairman: You have heard the motion, gentlemen, and the second, that we refer the paper presented by Mr. Halloran just before lunch on the question of a closer working arrangement between the various elements of this meeting to a special committee. I think it proper that that should be referred to the commercial committee for such action as it deems advisable, for the reason that in the commercial committee we have already a working organization. With the approval of Mr. Ballard, I am going to appoint a special committee on resolutions to convey our resolutions to the resolutions committee. I appoint Mr. Childs, Mr. Somers and Mr. Butte. We will now give Mr. Childs a chance to conclude in closing the subject of merchandising that he has so ably handled.

A. W. Childs: It seems that everything has been said that could be said that is germane to the subject, and every objection or point that has been raised has been answered. I made a few notes from time to time as the discussion progressed, but later speakers fully answered the former ones and the slate is clean.

The full discussion that we have had must result in benefit to every interest that is represented at this convention. When Mr. Kennedy was speaking, during the first part of his talk, I thought our company might be going out of the appliance business in Southern California. And I believe we would probably have done so then and there had it not been for the matter of load building, as has been fully explained.

Now, the central stations cannot afford to turn over to others the important work of load building until it has been fully demonstrated to them that it is in capable hands, and for that reason, gentlemen, the question, as I see it, is up to you. You will get the full co-operation of the companies whether you deserve it or not, but you will not get all of the latitude you may desire until you merit it. You may rest assured, however, that you will get it as fast as you deserve it and earn it. (Applause.)

THE ELECTRIC VEHICLE AS A LOAD BUILDER

The General Electric Review commenting editorially recently on the electric vehicle as a load for the central station tersely summarizes the points as follows:

The desirability of the electric vehicle business to the central station lies in the fact that it is practically all off-peak long-hour service, with a load factor of 30 to 35 per cent in comparison with a probable 10 per cent load factor for the electric motor. The author seems to favor the car-mile system of electric service charges, as by this system the customer with a little observation can foretell within narrow limits his electric vehicle service bill month by month. The scale of charges may be expected to vary for different sections of the country, depending upon the items that make up the cost of power production such as local coal prices; and in some cases a careful record of this business for say one year may show the need for a revision of the scale. In order to make the system as serviceable as the kilowatt-hour system, it might be well for the power companies to provide rates for any standard battery in any standard vehicle, rather than to restrict the rates to a certain make of battery in certain makes of vehicles as is the practice at present.

COMMERCIAL ASPECTS OF LAMP EQUIPMENT

The commercial section of the National Electric Light Association through its sub-committee on commercial aspects of lamp equipment recommends that:

Where semi-indirect lighting fixtures are installed, the use of appliances in conjunction with this type of fixture becomes more difficult, and something to take care of this condition is needed. We would suggest that next year's committee, as well as member companies, work on the design of an indirect or semi-indirect lighting fixture with an outlet for the extension cord.

Several possible solutions have been presented which should be given consideration. It is possible to drill the bottom of the bowl and insert a receptacle. This has the disadvantage of casting a shadow on the semi-direct bowl, which is objectionable. Then the bowl might be fitted with a brass ring and the outlet placed in the ring, being concealed by some sort of ornament when not in use. Another idea is to make the bowl hook large enough to contain the receptacle.

The need for some such equipment is great since the use of appliances must be encouraged if the residence and apartment income is to be maintained, and it is to the interest of every central station to push this proposition.

Another good way to build up the central station load on the off-peak period is to promote all-night burning of porch lights. As an incentive to do this a special fixture combining a porch light and an illuminated house number is recommended.

A unit of this kind will make the house number easily distinguishable and at the same time clearly light up the porch and steps. The income to the central station is increased, the householder has the satisfaction of knowing that his house is easily found and also protected from prowlers, and the street lighting is improved by the addition of numerous small units.

Something has been done along this line, but there is still room for development and it is well worth the time of any central station to go into the matter and work up an acceptable unit.

Your committee would suggest that all available material be turned over to national headquarters, so that the incoming chairman can have access to it. This material would also serve as a source of information to central stations, which could get it by applying to the secretary of the association. Member companies should not hesitate to avail themselves of this service.

SHORT JOURNEYS IN PACIFIC LANDS

(The typhoon, the water spout and other natural phenomena are occurrences in the Far East that the American engineer must reckon with should he engage in transpacific business with our foreign neighbors. Here is a description of some of these things as observed by the editor of the Journal while on a recent tour of Pacific lands in the Far East in an endeavor to form an opinion as to the possible future commercial and engineering relattions these countries may play with engineers of the Pacific Coast.—The Editor.)

PHENOMENA IN ORIENTAL SEAS OF INTEREST TO THE ENGINEER

The American engineer who dares to cross the Pacific and engage in practice in the Far East meets with an abundance of natural phenomena, the laws and occurrence of which together with a study of the methods of lessening their baleful effects, become of prime importance.

It is the purpose of this article to call attention to some of these phenomena with the idea more of laying the seed for serious thought on the reader's part should occasion later demand its deep and complete analysis, rather than burden the reader too heavily with information of heavier sort at this time.

I shall narrate several experienecs as they happened to me while on a recent tour of the Orient and in this unconventional manner relate to the reader some of these new and strange phenomena of which many of us have at times read, but few experienced.

The Typhoon

Of all the deadly and uncontrollable forces of nature which infect the seas of the Far East during certain months of the year, the typhoon is by far the most to be dreaded.

The costly and massive structures erected by the English at Hong Kong are not so much a monument to their love of expenditure their love of expenditure to acquire permanency in construction, as for a protection against the deadly typhoon.

The typhoon is no more nor less than a terrific gale which comes with such force and dash as to sweep all before it. Indeed, vessels in the harbor of Hong Kong, securely anchored, have faced about towards the typhoon with all the force and power of their driving apparatus under full swing, and still been dashed backwards dragging their anchors with them. Lives by the thousands are lost under the heavy and terrific strain of the typhoon. Hence the only safety of the ocean going vessel is to be in an unusually sequestered harbor or else put out to open sea. The vessel can stand the rolling of the high seas if only it can be directed away from the shoals and rocks.

THE ISLAND OF FORMOSA

This island, three hundred miles in extent, owned by Japan as a prize of war taken from China, stretches in a north and south direction about midway between the main Japanese Islands and the Philippine Group. Ninety per cent of the world's supply of camphor is shipped from here. Its mineral wealth is very extensive and its prospects for sugar production exceedingly bright. The Japanese consider it their richest colonial possession. It is off the rugged east coast of this island that beautiful water spouts play and the terrific typhoon generates much of its destructive violence. It is only by the study of new and hitherto unencountered phenomena such as these that the American engineer can hope to successfully engage in engineering practice in the Far East.

The typhoon seems to be more frequent in occurrence during the months of July and August. Hardly a day passes at this period but somewhere in the area subject to their violence one is under way. The months of the year in which they may occur are well included as a rule in the adage at the tongue's end of everyone having business either upon or near the wind swept shores of the Orient:

"June—too soon
July—stand by
September—remember
October—all over."

On my return trip to Japan, when about one day out from Nagasaki, Japan, we experienced the first warnings of a severe typhoon. For some time previous the captain had received wireless messages from ships further south that were encountering it. Most all the typhoons originate about a thousand miles east of the Philippine Islands somewhere near the United States naval base and cable station known as the Island of Guam. The typhoon then usually travels westerly or northwesterly in direction.

Upon arriving at the harbor of Nagasaki, which is well protected, we enjoyed a comparatively quiet night. The next morning, however we noticed that all chairs and rigging were most securely lashed and it was not long before we knew the reason why. The suddeness with which the real typhoon arrives is certainly hair raising. The howling, the clattering, the driving are all indescribable. While one side of the ship is experiencing severe strain, the other side is comparatively quiet with a score of huddling cabin passengers out observing the sea to report to the more timid within.

On all sides on this particular occasion we could see its baneful effects. Fishing boats were smashed and lives lost with no one daring to lend aid. A tempting prize in the nature of a first class fishing boat was driven out of harbor with no one aboard. This caused a young Japanese to dive in to claim it. With all the power he could exert even in the sequestered harbor

of Nagasaki, he was unable to control its course in any manner and soon found himself a helpless clamorer for aid clinging to a friendly buoy which happened in his path. Lucky it was for him that the typhoon soon subsided sufficiently for aid from a near by tug boat to be given.

By noon we looked ashore and though the typhoon signal was still up to warn shipping in the harbor, nevertheless such a calm was then presenting itself that the captain of our boat determined to put to sea. It turned out, however, that this perfect stillness was caused by our being at that time in the center of the raging typhoon which is usually a great calm, and upon poking the nose of our vessel out to sea the captain soon determined for the safety of cargo and passengers to return to port for another day.

The next day as we journeyed up the Japanese coast evidence of the unrelentless devastation of the day before was to be seen on all sides. Sunken fishing boats and wreckage of every nature was visible everywhere. The captain of the steamer Mongolia distinguished himself by bringing his ship to a stop during the storm and rescuing fourteen Japanese from certain death, for which valiant service a public reception at Yokohama was tendered him on his homeward voyage where he received the thanks of the Emperor of Japan.

And so it is that the engineer who is to engage in construction work of any nature whatsoever in the Orient must familiarize himself with methods of protecting his engineering creations from the onslaught of the typhoon.

PROPOSED GIGANTIC ELECTRIFICATION IN SOUTH RUSSIA

Moscow capitalists are organizing a stock company to provide electric current for the operation of the coal and other mines and the metallurgical and miscellaneous manufacturing industries of South Russia. A capital of 150,000,000 rubles, equal at present exchange rates to about $42,850,000, is proposed for the beginning of operations. The plan embraces the erection in the Donets coal basin of three electric power stations of 75,000 horsepower capacity each. It is proposed to transmit power from these stations not only to the mines of this region but also to the industrial towns and villages and to separate industrial plants in the governments surrounding the Donets district. The intention is to provide current for the iron and manganese mines, the blast furnaces, rolling mills, machine and miscellaneous metallurgical works, salt works, factories, and the cities and towns of this section, which is one of the most important industrial regions of the country and seems destined to become the most important. A total consumption of power to the amount of 420,000,000 kilowatts is estimated for the proximate future, after the war. It is not expected that ground will be broken during hostilities.

SOUTH CHINA A MARKET FOR ELECTRIC PLANTS

The new electric light plant at Mengtsz, in Yunnan Province, was put in operaton in the summer of 1916. This town is the customs station on the line of railroad from Haiphong, in the French territory of Tonkin, to Yunna, the capital of the Province, which at present furnishes the latter with its only means of rapid transit to and from the outside world.

LINKING UP OF ELECTRICAL SYSTEMS IN ENGLAND

Recent circulars issued by the Board of Trade urging economy in the consumption of electricity and co-operative work in generating plants are responsible for the inception of a plan to connect the largest electrical systems in England and Scotland. The proposal is directly concerned with the thickly populated industrial centers in Lancashire, Cheshire and Yorkshire, although the systems of London and the south of Scotland are included as indispensable factors in the tentative scheme of intercommunication.

The Incorporated Association of Electric Power Companies and the Incorporated Municipal Electrical Association have appointed committees to investigate and report upon the feasibility of the proposed linking systems. The report of the Yorkshire committee is expected in the course of a few weeks; the Lancashire and Cheshire committees have already reported favorably for the adoption of the proposal.

It was estimated that the cost of intercommunication of the various groups of the undertaking in Lancashire and Cheshire would be £281,399 ($1,393,419), but that the saving in coal consumption alone—taking coal at 17s. 6d. ($4.25) per ton—would amount to £82,000 ($393,053) a year. However, as the present export value of coal is 45s. to 50s. ($10.94 to $12.16) per ton, the economy in reality would be greater.

With reference to the practicability of the system for Yorkshire, it is suggested that by linking up the cables of the Leeds, Bradford, Huddersfield and Morley municipalities with those of the Shipley District Council and the Yorkshire Electrical Power Company, a great deal of waste incurred when the machinery is run for light loads would be prevented, and on specified days and nights one or more of the plants could be stopped entirely.

The ownership and operation of electrical plants in the cities are usually vested in the municipal government or corporation, and any economies effected in the cost of production per unit would be reflected in a corresponding reduction in the price per unit consumed by the public.

Coincident with the publication of articles suggesting the connection of electrical systems, the Yorkshire Post published an article advocating the establishment of central power stations, or mammoth generating plants, near the principal collieries of the country, where in the process of carbonization the valuable by-products of coal would be carefully collected and the resultant gas used for the further generation of electricity or piped to the consumer. The greatest difficulty appears to be the lack of adequate water supplies in the principal coal fields, which would necessitate an additional outlay in providing the necessary water for cooling towers and similar usages. It is confidently stated that the saving effected by such a system of generating and distributing electricity would provide it to the consumer at a cost that would entirely obviate the economic waste and the smoke nuisance incident to the carbonization of volatile coals in homes as well as in factories.

SUGGESTIONS FOR CONTRACTOR AND DEALER

DEPARTMENT CONDUCTED BY GEORGE A SCHNEIDER

(The installation of starting compensators has been the source of much confusion, especially in California, where the recently promulgated Utilization Safety Orders have now become effective. Here is a timely discussion that will prove most helpful to the contractor and dealer, who must understand how to solve this problem. This article discusses recent development along the line of proper installation of this class of apparatus. The author is power apparatus specialist for a well-known electrical supply house of the West.—The Editor.)

NOTES ON THE INSTALLATION OF STARTING COMPENSATORS

There seems to be more or less misunderstanding on the part of many electrical dealers and contractors, wiremen or others interested as to just how installations of starting compensators for polyphase motors shall be made to comply with the requirements of the Electrical Utilization Safety Orders issued by the California Accident Commission. The questions which seem to be brought up most frequently are those relating to the kinds of switches to be used with compensators, the conditions under which switches are required and in connection with the use of overload relays as a substitute for fuses.

The principal orders applying to such installations are as follows:

Order 747 (c) which provides that manually-controlled starters for motors shall be so designed and circuits so arranged that they will return automatically to the "off" or starting position upon failure of the energy supply, except where motors are under competent supervision and equivalent protection is otherwise provided.

Order 737 which provides for the disconnection of fusible cutouts before being refused, etc.

Order 740 which requires that in connection with certain circuits or under certain conditions switches with protected current carrying parts shall be used.

Order 736 which states that means shall be provided so that switches controlling motors can, when closing would cause a hazard, be locked in the open position and tagged to prevent careless closing.

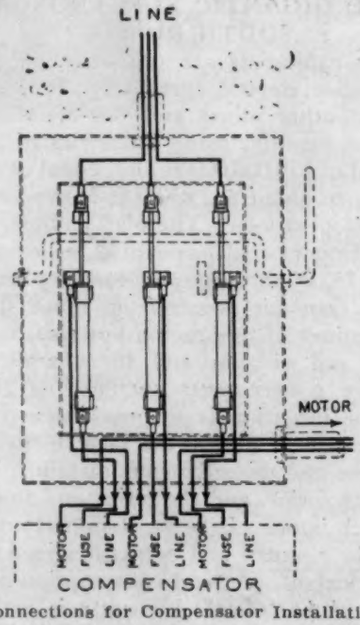
Order 703 covering grounding of apparatus.

In connection with new equipment we may eliminate a discussion of order 747 (c) since all modern compensators are equipped with mechanisms to give low-voltage protection, as required. However, it can be stated that the provision of low-voltage protective features on a controlling device is a most effective means of eliminating accidents since it prevents the unexpected re-starting of a motor or motor-driven machine after it has been shut down due to failure in power and after the line is again energized.

While all of the modern designs of compensators have low-voltage features and therefore comply with order 747 (c) as stated, none of them, to the writer's knowledge, meet the requirements of order 737 since even with the compensator handle in the "off" position the fuses at the compensator, also part of the contacts within the compensator, are alive unless there is a separate switch to completely disconnect these parts from the line. Removing the fuses does not help matters very much because even under these conditions the line contacts in the cutout and also part of the contacts within the compensator are still alive. Therefore, a switch is required immediately ahead of the compensator to completely disconnect it and the fuses from the line.

This switch may be non-fusible but should have a sufficient number of poles or blades to completely disconnect all wires of the circuit. In accordance with order 740 this switch shall have suitable casings or guards to protect the operator from danger of contact with the current-carrying parts, effective during ordinary operation. This requirement is best complied with by using enclosed, externally-controlled switches. The order is generally interpreted to mean a switch of this type. Further, as provided in order 736, this switch must be designed so that it may be locked in the "off" or open position when necessary.

When compensators are equipped with suitable overload relays instead of fuses for overload protection the line switch directly ahead of the compensator is not required. This is on the theory that a person



Connections for Compensator Installation

having sufficient knowledge to repair or adjust a compensator or its relays will also have judgment enough to know that the main or branch switch controlling this particular circuit should first be opened and therefore would not attempt to work on the live parts. This is no doubt a very safe assumption. Thus, a compensator equipped with relays will meet all the requirements noted provided it can be locked in the "off" position, as compensators are accepted as externally controlled devices. Very few of the compensators of

present designs have this feature but some form of lock can be readily applied to them. It is more than likely that many re-designed types of compensators will shortly appear on the market and no doubt all of them will fully comply with the orders herein noted and the "Safety First" idea in general. In the writer's opinion these new lines of compensators will have overload relays built as an integral part, while fusible types will be considered as sub-standard.

These orders also require that fusible cutouts shall be protected so that persons cannot come in contact with the current carrying parts; therefore, in addition to the line switch some sort of enclosing cover or casing must be provided for the fuses and cutout. The cover or casing must also carry a warning against removal of the fuses before the switch controlling the circuit is opened.

Installations of this kind can be very conveniently and easily made by using the new type compensator switches recently placed on the market by several manufacturers. In this device the line switch and compensator fuses are combined in one unit. These switches are of the single-throw, bottom-fused, enclosed, externally-controlled type and are identical in construction with standard switches of the corresponding type except that a lug is attached between the hinge jaws and upper fuse clip on each pole to receive the starting leads to the compensator as shown in the accompanying diagram.

When connected in this manner the fuses are not in the circuit during the starting period and therefore should be of the proper size to protect the motor during running. Ordinarily these fuses are selected to allow 25 per cent overload but, as pointed out in this department in the last issue of the Journal, fuses for 10 per cent overload will probably be recommended for the "50 degree" motors which will shortly be on the market. Fuses selected on either basis will also protect the motor against operating single-phase. In ordering switches of this type, the size must be selected according to the size of "running" fuses and not on the capacity of "starting" or branch circuit fuses.

The various orders herein noted do not require the use of externally-controlled switches except on circuits of over 150 volts to ground or when installed in damp places or where some local condition would entail a particular hazard, but as practically all polyphase motor installations involving a compensator come within these restrictions, the question of voltage has been purposely eliminated so far in this discussion.

It is a fact that very few polyphase motors larger than 5 h.p. are operated from 110 volt circuits, therefore, practically all polyphase motors operate at 220 or higher voltages. Even with one transformer grounded on the secondary side in accordance with usual practice for protection of lighting circuits, which are often supplied from the same transformers, the maximum voltage to ground is somewhat above 150 volts on 220 volt power circuits with standard connections ordinarily employed. The most common exception is the 4-wire 3-phase power circuit operating at 210 volts between outside conductors giving about 120 volts to ground with the neutral point grounded. Even in localities where these circuits are employed to some extent, the writer is informed that installations must be made as though the motors were operated on a 220 volt power circuit with over 150 volts to the ground. In general for all practical purposes it may be considered that all polyphase motor installations of 7½ h.p. and larger shall comply with the orders as herein outlined. This is assuming that all polyphase motors 7½ h.p. and larger will be started by compensators in accordance with the common practice for squirrel cage motors.

The question of grounding will not be discussed at this time as a general article on this subject will appear in this department in a later issue.

The information here given is based upon the writer's personal interpretation of the orders but is believed to be reasonably correct. However, when definite decisions regarding installations of this kind are needed it is well to take up the question with the inspector having jurisdiction in that particular locality.

CHANGING MOTORS FROM TWO TO THREE-PHASE OR VICE VERSA

Motors are often changed from two to three-phase or vice versa by reconnecting the windings. The results are usually not very satisfactory. This will be easily apparent by a brief study of the voltage relations in the two windings. Theoretically, there should be about 25 per cent more turns in a two-phase winding than in a three-phase winding for the same voltage. Hence, if a three-phase motor is reconnected for two-phase service at the same voltage, its performance will be the same as a motor operating at 25 per cent above voltage, which means its temperature would reach a dangerous limit in a very short time because of the increased exciting current. Conversely, if a two-phase motor is connected for three-phase at the same voltage its performance will be the same as a motor operating 20 per cent below normal voltage. By cutting out 20 per cent of the total coils the voltage across the remaining coils will be about normal. Even under these conditions the three-phase output will have to be reduced about 12.5 per cent below the original two-phase horsepower. This is because the full load current of a three-phase motor is about 12.5 per cent greater than the corresponding two-phase machine at the same voltage and if the horsepower is not reduced there would be increased heating due to the greater current density in the windings.

Still another method of adapting a two-phase motor to three-phase service is to use the T or Scott connection. In most windings this connection gives rise to unbalanced currents in the three-phases which effects the performance of the motor. The starting torque will be considerably less and the temperature rise much higher if the motor is loaded to its original two-phase capacity. The efficiency and power factor will also be poorer.

The change from two to three-phase is the most satisfactory of the two because the coils are not subjected to over voltage and will not overheat if the motor after being changed is not loaded to full capacity. Generally speaking, however, these changes are not to be recommended except under very favorable conditions. It is far better to rewind with regular three-phase coils and avoid trouble.

ELECTRIC POWER FOR IRRIGATION PUMPING

DEPARTMENT CONDUCTED BY S. T. HARDING

(A discussion of the character of electric pumping plants in their relation to power rates granted by large hydroelectric companies of the West presents a new view point for consideration by engineers throughout the West. Here is an article on this subject which cites instances from the practice of the San Joaquin Light & Power Corporation of California. The author is valuation engineer for this company and is unusually well qualified to speak authoritatively upon this important subject.—The Editor.)

USE OF POWER AND RATES FOR IRRIGATION PUMPING

BY G. R. KENNY

The San Joaquin Light & Power Corporation adopted the flat rate per horsepower of maximum demand per season rate in the beginning and has kept it in effect ever since. This rate has had the effect of inducing the consumer to put in a small installation and run it as nearly continuously as possible which has resulted in very high load factors and very low rates per kw.-hr. with consequent low cost per unit of water delivered.

In the neighborhood of 50 per cent of the installations are equipped with reservoirs which enable the consumer to pump 24 hours per day, and at the same time, have a large head of water for irrigation in daylight hours. The reservoirs are usually about 4 ft. deep and vary in size from about 90 ft. by 90 ft. to 200 ft. by 200 ft., the shape depending upon the location with respect to buildings, trees, etc. Many of them are three times as long as wide. The capacity is usually from 1 to 4 acre feet. They should hold sufficient water for 18 hours pumping. The method of construction generally followed is to scrape off the bottom of the site to form the reservoir walls. In the majority of cases, the reservoir holds water satisfactorily without any further treatment. If it does not, it must be either puddled or oiled. The oiling is generally entirely satisfactory, and oil can always be obtained, while suitable puddling material may be hard to secure. Concrete gives the best results but is too costly. The reservoir excavations cost from $50.00 to $100.00, and the oiling from $100.00 to $300.00, depending upon the size, kind of soil, distance that the oil must be hauled, etc. Water is used from the reservoir at a rate of from 300 to 400 miners' inches. This gives a very satisfactory head for irrigation, and an irrigation can be made with 25 per cent to 50 per cent less water than if a stream of 100 inches is used.

Some data from typical districts on acreage irrigated and cost of power per acre follow:

Table I.—Data on Irrigated Districts Served

	Alfalfa Territory	Citrus Fruit Territory
Acreage irrigated	22,893	9495
Horsepower used	1623.84	1470.75
Acres per horsepower	14.1	6.5
Average acres per h.p., all classes of crops.		10.5
Average costs per acre alfalfa territory...		$3 to $4
Average costs per acre fruit territory.....		$6 to $7
Average costs per acre all territory.....		about $4.25

Practically all of the pumps in use are of the direct connected centrifugal type. For the deep well pumping, the turbine and plunger types of well pumps are installed. The pumping motors on the system vary in size from 3 h.p. to 75 h.p. only a very few being in excess of 15 h.p. while the average at the end of 1916 was 10.4 h.p.

There are several consumers who pump into ditches for distribution for a number of water users and it is in these cases that the larger sizes of motors are used. It now seems probable that this scheme may be followed in a number of other sections by the formation of irrigation districts, by organizing public utilities or in other ways.

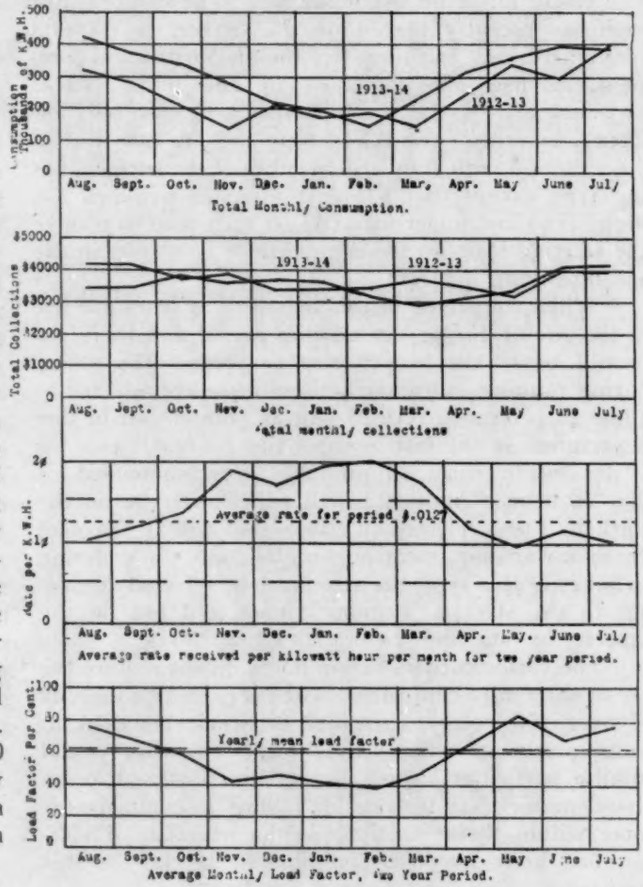

1913-14
1912-13
Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June Jul
Total Monthly Consumption.
Total Collections
Total monthly collections
Average rate for period $.0127
Rate per K.W.H.
Average rate received per kilowatt hour per month for two year period.
Yearly mean load factor
Load Factor Per Cent.
Average Monthly Load Factor, Two Year Period.

Fig. 1. Consumption, Collections, Rate per kw.-hr. and Load Factor for all $50 Flat Rate Consumers Served Continuously from August 1, 1912, to July 31, 1914

The rates provide for seasonal use for from three to twelve months, the average rate per h.p. per month decreasing as the length of the period increases. The present system of rates provides four distinct rates. A flat seasonal charge per h.p. of maximum demand, a flat seasonal charge per h.p. of connected load, equal to 94 per cent of the maximum demand charge per h.p. and demand and energy charge rates with the demand charge varying in the same manner as the flat rates above. If the consumer's maximum demand is approx-

imately the same as his connected load, he is given the connected load rate, and if not, he takes the maximum demand rate and his maximum demand is determined monthly by the use of maximum demand indicators permanently installed, or in some other manner. Much dissatisfaction has arisen since the maximum demand indicators have been installed due to the fact that they register the starting load on centrifugal pumps which averages 10 per cent in excess of the normal running load. The demand indicators are set for a fifteen minute period. Some recent tests indicate that a one hour average maximum demand at starting will give results averaging from 4 per cent to 5 per cent in excess of the regular pumping load. Prior to installing the maximum demand meters it was the company's custom to determine the maximum demand by tests taken at least once during each irrigation season. The rates based on the maximum demand are as follows:

Table II.—Rates Based on Maximum Demand

Months Continuous Service	Contract Flat Rates Rates per h.p.	Meter Rates Meter Charge of $.005 per kw.-hr. Added to Following Demand Charges
3	$17.50	$10.40
4	21.55	12.50
5	25.15	14.30
6	28.50	15.95
7	31.65	17.45
8	34.55	18.85
9	37.35	20.10
10	40.00	21.30
11	42.55	22.40
12	45.00	23.45

The irrigation pumping business is necessarily seasonal, although many consumers find it advantageous to irrigate throughout the year. It is generally felt that winter irrigation is necessary for the best results with alfalfa. Citrus fruits are benefited by winter irrigation and the moisture in the soil prevents freezing if the temperature does not go too low.

The annual load factor of the irrigation business as a whole is low, but the load factors for individuals for their season, or for groups having the same season, is high. The diversity factor is low, as all the plants are run to capacity throughout the dry summer months.

The tabulation, Table 3, summarizes the results of a very careful study of the operating conditions of all irrigation consumers as shown by the records of their accounts for the period covered. The rates are those in effect prior to May 1, 1916.

Fig. 1 gives the average rate per kw.-hr, the average load factor by months, by years, and for the period for the 85 consumers who were served on the $50.00 per h.p. per year, flat rate, from August 1, 1912, to August 31, 1914. The average rate for 1912-13 was $.01342 and for 1913-14 $.01219 per kilowatt hour. The annual load factor in 1912-13 was 57.9 per cent and in 1913-14, 63.7 per cent.

Table IV.—Gasoline Pumping Plants and Irrigation Data Covering Gas Engines Operating in Territory Served by S. J. L. & P. Corporation, within One Mile of Power Line

Fresno District Only

	Average depth to water (feet)	18.4
	Used h.p. (per plant)	3.64
Classes of Irrigation:		
1.	Pumping out of ditch	30
	H.P. of same	161
	Average size of engine	5.4
	Acres per h.p.	5.9
	Hours run per plant per year	269
2.	Auxiliary to ditch	261
	H.P. of same	2682
	Average size of engine	10.3
	Acres per h.p.	4.2
	Hours run per plant per year	269
3.	No. of engines irrigating where no other water is used	224
	H.P. of same	1693
	Average size of engine	7.6
	Acres per h.p.	3.3
	Hours run per plant per year	322
	No. of irrigation engines that are used for domestic pumping	90

In order to determine the conditions of use of gas engines for irrigation, a survey of all gas engines operating within one mile of the company's lines was made in 1915. It was found that in general, the gas engines were used where but little irrigation was required, when water was pumped from ditches, or where water was needed to supplement ditch irrigation after the ditches had gone dry. The engines are generally run for only a short period each year. About 1200 engines were visited and the conclusion reached after the information obtained, was examined, was that in the majority of cases, the plants now pumping by gas engines could not be taken over for electric service to the advantage of either the consumer or the company. There are certain classes of power irrigation for which the gas engine, due to its low annual cost, if operated but little, may be used with considerable economy as compared with electric power. In table 4 the results of the survey of gas engines in the Fresno district are given.

Table III.—Summary of Data from Flat Rate Consumers' Accounts—Agricultural—January 1, 1912, to July 31, 1914

Kind of Contract		Maximum Demand								Load Factor	
No. Mo. Operated per year	No. Hrs. Operated per day	H.P.—Latest	H.P.—Average	Connected Load—h.p.	No. Consumers	Av. h.p. per Consumer	Rate per h.p. per month	kw.-hr Used to Date	Amt. Collected to Date	Av. Rate per kw.-hr.	Annual Per Cent	Period
12	24	3171.17	3204.17	3707.00	344	10.80	4.167	18,539,753	246,871.13	.01331	57.2	57.2
12	Daylight	332.20	327.29	365.50	38	9.6	3.00	882,852	17,916.40	.01920	28.6	28.6
7	24	232.36	243.26	243.00	23	10.5	5.75	1,101,348	13,524.94	.01230	49.8	85.3
7	Daylight	86.71	86.50	85.00	10	8.5	4.14	201,858	4,816.45	.02380	17.2	59.06
6	24	253.44	255.58	273.50	29	9.43	6.25	731,572	15,428.74	.02130	22.6	45.2
6	Daylight	296.33	221.44	295.50	26	11.4	4.50	611,254	15,752.85	.0258	16.0	32.0
5	24	127.13	130.09	127.50	11	11.6	6.25	381,516	5,769.65	.0151	32.4	77.7
5	Daylight	225.95	224.41	239.50	21	11.7	4.50	255,993	6,803.40	.0266	12.9	31.0
4	24	142.53	145.20	153.50	18	8.5	6.25	438,222	8,012.25	.0183	20.9	62.7
4	Daylight	86.87	84.82	81.50	11	7.4	4.50	77,113	3,069.25	.0396	6.9	20.7
3	24	4.54	4.58	5.00	1	5.0	6.25	15,963	293.55	.0184	15.4	61.6
3	Daylight	24.27	23.66	25.00	2	12.50	5.50	33,362	776.45	.0233	10.8	43.2
Total flat rates,		4983.50	4951.00	5601.50	534	10.49						
Colonization and Spec.		1244.08	1229.21	1456.50	113	12.88	....	23,270,806	338,135.06	.01453	....	....
								1,969,411	42,098.02	.0213	....	....
Grand Totals....		6227.58	6180.21	7058.00	647	10.91	....	25,240,217	380,233.08	.01506	....	....

FUEL OIL AND STEAM ENGINEERING

(How to accurately determine the moisture present in saturated steam is a useful and necessary adjunct to efficient steam engineering economy in fuel oil practice. In this discussion the authors first describe the types of calorimeter used for various degrees of moisture encountered and by citing carefully computed illustrations of their use, the reader is step by step led to follow the reasoning set forth in such a manner that a thorough grasp of this important subject should be attained by its careful perusal. The discussion concludes with details of corrections that should be applied and a recounting of the hints for the proper use of the various types of calorimeter to be employed.—The Editor.)

THE STEAM CALORIMETER AND ITS USE IN FUEL OIL PRACTICE

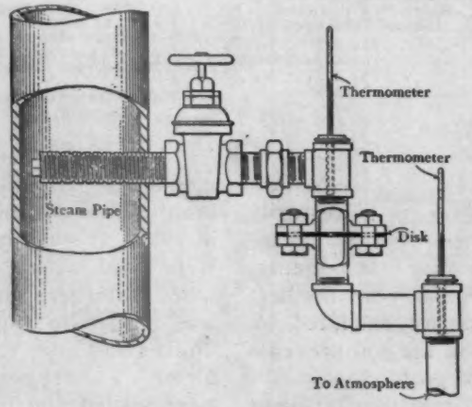
BY ROBERT SIBLEY AND CHAS. H. DELANY

We come now to a consideration of the methods used in steam engineering practice to accurately determine the moisture content of saturated steam. In the preceding chapter certain approximate methods were set forth, but in the following discussion it will be seen that by care and patience the moisture content of saturated steam may be ascertained with a wonderful degree of accuracy.

The Chemical Calorimeter.—The chemist has a method of determining the moisture content which finds little application in the steam engineering laboratory, but in the chemist's laboratory it is performed with a remarkable degree of accuracy. Certain salts absorb moisture held in a vapor. Hence by passing wet saturated steam over such salts, the moisture content is taken from the steam and by weighing the moisture so absorbed the degree of moisture held in suspension is ascertained.

The Throttling Calorimeter.—By reference to the steam tables it is seen that when saturated steam exists at say 200 lb. pressure per sq. in., each pound of steam represents a storage of heat equal to 1197.6 B.t.u. For it is seen from the steam tables that it took 354.4 B.t.u. to bring the original pound of water from 32° F. to its boiling point and then an additional 843.2 B.t.u. to evaporate this water into dry saturated steam.

Let us suppose for a minute this steam at 200 lb. per sq. in. were allowed to flow through an orifice and expand into a chamber which was at but 14.7 lb. per sq. in From the steam tables it is seen that saturated steam existing under such a pressure holds in storage but 1150.4 B.t.u. What then becomes of the difference between 1197.6 B.t.u. and 1150 B.t.u. represented by the heat held in storage in the two instances? Evidently if the main at the lower temperature be well hooded so that no heat escapes, the heat given out must go toward superheating the steam at the lower pressure. Since the specific heat of superheated steam at the lower pressure is about .47 the 47.2 B.t.u. that are liberated would evidently superheat the steam about 100°. The actual measurement, then, of this superheat gives us at once a most accurate method of determining the quantity of moisture present in the steam at the original pressure. For if we find that the steam is superheated only 25° F., instead of 100° F., evidently some of the mixture must have been water for otherwse its existence at the higher temperature as steam would aid in superheating still further the lower mixture.



THE THROTTLING CALORIMETER AND THE SAMPLING NOZZLE

In the typical throttling calorimeter, steam is drawn from a vertical main through the sampling nipple, then passed around the first thermometer cup, then through a one-eighth inch orifice in a disk between two flanges, and lastly around the second thermometer cup and to the atmosphere. Thermometers are inserted in the wells, which should be filled with mercury or heavy cylinder oil. Due to the fact that the heat content in the steam under the expanded condition with which it reaches the second thermometer, is much less, the heat thus liberated superheats the steam at this point and thus a means is given for ascertaining the moisture originally in the steam sample.

A throttling calorimeter, then, is simply a contrivance by which we allow steam to pass from its higher pressure through a small opening where its temperature and pressure are taken before it passes out into the atmosphere. Prior to its passage through the small opening, the temperature and pressure of the steam is noted. Let us denote by "s" subscripts the conditions of superheated steam in the low pressure chamber, "o" subscripts the steam in the steam main, and "3" subscripts saturated steam at the pressure of the low pressure chamber.

Each pound of wet saturated steam in the steam main has X_o parts by weight existing as dry steam. Hence the total heat represented in each pound of this steam is evidently $(X_o L_o + h_o)$ heat units as seen from close inspection. In the same manner each pound of steam in the lower pressure chamber holds in storage $[(H_3 + C_{pm}(t_s - t_3)]$ heat units as seen from previous reasoning. Since no heat is allowed to escape, evidently these expressions are equal one to the other, or

$$X_o L_o + h_o = H_3 + C_{pm}(t_s - t_3)$$

C_{pm} for the low pressures has a value of 0.47, hence, we have

$$X_o = \frac{H_3 + 0.47(t_s - t_3) - h_o}{L_o} = \frac{H_s - h_o}{L_o} \quad \ldots (1)$$

in which H_s is the total heat of superheated steam in the low pressure chamber. Its numerical value may be taken directly from the steam tables when the pressure and degree of superheat are known.

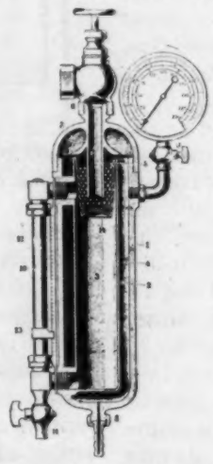
As an illustration, let us assume that the pressure in the steam main is 153.6 lb.. per sq. in. abs. and that its temperature is found to be 362.9° F., thus indicating at once that the steam is saturated and not superheated. After it has expanded into the low pressure chamber it is found to have a temperature of 261.3° F. and a pressure of 14.8 lb. per sq. in. absolute.

From the steam tables we find $L_o = 859.6$; $h_o = 334.8$; $H_s = 1150.5$; $t_s = 261.3$; $t_s = 212.4°$ F.

$$\therefore X_o = \frac{1150.5 - 334.8 - .47\,(261.3 - 212.4)}{859.6} = .9758$$

Therefore the steam is evidently 97.58 per cent dry.

The Limitations of the Throttling Calorimeter.—A little consideration of the underlying principle of the throttling calorimeter brings to light a definite range of limitation to its usefulness. It will be remembered that this fundamental principle consists in liberating sufficient heat at the lower pressure not only to evaporate any moisture that may exist but to actually superheat the entire mixture. If there is not sufficient heat liberated, that is if too much water is held in suspension in the saturated steam, the steam at the lower pressure fails to become superheated and hence we have no means of measurement.



THE SEPARATING CALORIMETER

In this type of separating calorimeter the steam, with its moisture enters from the steam main at 6 and is forced to travel downward toward 3 at a high velocity. At 14, however, the direction is suddenly reversed upward toward 7 and later passes downward through 4 and out into the atmosphere at 8. When the sudden reversal takes place at 14, the moisture in the steam collects at 3 and its content is measured on the gauge 12. The steam content, on the other hand is calculated by means of Napier's formula as it passes through the orifice at 8 as illustrated in the text.

Thus if steam pass from 100 lb. absolute pressure per sq. in. to 30 lb. absolute pressure per sq. in., the total heat at the upper pressure is $(X_o L_o + h_o)$ which from the steam tables becomes $(X_o\,888 + 298.3)$ heat units and that at the lower pressure is H_s, or 1163.9, if it be not at all superheated. Hence we have

$$X_o\,888 + 298.3 = 1163.9$$

$$\therefore X_o = \frac{865.6}{888} = .9748$$

This means that if there is a greater moisture content than 2.52 per cent the steam calorimeter will fail to work because the mixture in the lower pressure space does not become superheated.

If instead of having the low pressure of 30 lb. absolute per square inch, the steam in the calorimeter had been throttled down to 14.7 lb. the value of H_s would have been 1150.4 instead of 1163.9 so that X_o would become .9597 and the limit of the calorimeter in this case would be 4.03 per cent of moisture.

Again if instead of steam at 100 lb. absolute pressure we had steam at 200 lb. and allowed the sample in the calorimeter to be throttled down to 14.7 lb. it may be found in the same way that the limit of the calorimeter is 5.66 per cent of moisture. It is thus seen that the greater the difference in pressure between the high pressure and the low pressure in the calorimeter, the greater is the range of the calorimeter.

The Electric Calorimeter.—It is now evident that if a definitely measurable quantity of heat could be added to the steam before it was allowed to expand, even very wet steam might be accurately measured by the throttling calorimeter. This is seen at once when we analyze the total heats involved. If E_o be the heat units added to each pound of steam, then the total heat possessed by each pound of steam in the high pressure main is $(X_o L_o + h_o + E_o)$ heat units and since the heat in each pound of steam in the lower chamber is H_s, we have, since no heat escapes

$$X_o L_o + h_o + E_o = H_s$$

$$\therefore X_o = \frac{H_s - h_o - E_o}{L_o} \quad (2)$$

In the Thomas electric meter an electrical mechanism has been invented whereby a series of small wires electrically heated impart a known quantity of electrical energy to the steam. This electrical energy dissipates itself as heat and since we can transfer electrical units into heat units and vice versa, a ready means is provided to assist the throttling calorimeter in doing its work by adding sufficient heat to widen the range of the throttling process.

Thus, although the throttling calorimeter was found definitely limited above as set forth, let us investigate a case where the electrical calorimeter may be used. Let us assume the upper pressure to be 200 lb. per sq. in. and the lower pressure 15.0 lb. per sq. in. In this case there were electrically added exactly 40 B.t.u. of energy and the temperature of superheat t_s was found to be 233.0° F., hence from the steam tables we find

$L° = 843.2$; $h_o = 354.9$; $t_s = 233.0$; hence, $H_s = 1160.1$

$$\therefore X_o = \frac{1160.1 - 354.9 - 40}{843.2} = 0.908$$

The Separating Calorimeter.—In the separating calorimeter the moisture is mechanically separated from the steam. If we know the total amount of steam passing and also the weight of the water separated from the steam, it is of course an easy problem to compute the dryness of the steam. Thus, if W_1 is

the weight of water separated per hour in the calorimeter and W_2 the weight of dry steam passing out of the calorimeter per hour, we have by inspection

$$X_0 = \frac{W_2}{W_1 + W_2} \quad \ldots\ldots (3)$$

Hence, if a separating calorimeter deposits 285 lb. of water per hour and if 10,000 lb. of dry saturated steam leave the calorimeter per hour, the dryness of the steam is

$$X_0 = \frac{10000}{10000 + 285} = 0.972$$

There are many principles upon which the separating calorimeter may operate. There are two forms, however, which are more usual than others. In one instance the steam mixture is given a rotary motion in its journey and consequently the water particles are thrown off by centrifugal force and collect in a drip below. In the other instance the stream flow receives a sudden reversal in direction. As dry steam easily performs this feat and water insists upon continuing its former direction of flow a separation is thus mechanically effected.

This type of instrument is not as accurate as the throttling type, as it does not get all the moisture out of the steam. When large quantities of moisture are present, however, it proves useful in taking out the bulk of the water or moisture while a throttling calorimeter connected in series later on accurately measures the remaining water content present. Thus by such a method of operation any degree of moisture present in steam is easily and accurately measured.

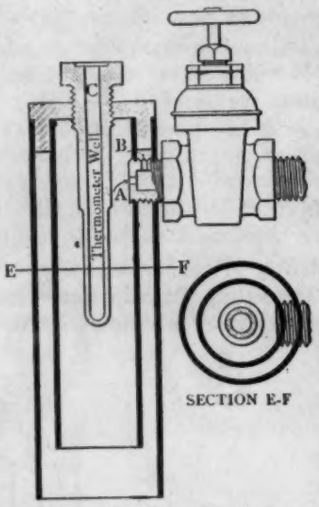
Correction for Steam Used by Calorimeter.—In a great many instances the total weight of steam passing per hour through the steam main under test is of prime importance. Since most forms of calorimeter operate by diverting a portion of this steam out into the atmosphere, it becomes necessary to have some quick and ready means of computing the quantity of steam so diverted.

Many years ago Napier deduced an approximate formula for the flow of steam into the atmosphere from a high pressure source. This formula is well within the degree of accuracy required for steam diverted through the calorimeter. If W is the pounds of steam flowing per second, p the pounds of pressure per square inch exerted by the steam in the main, and a the area of the orifice in square inches through which the steam passes, then

$$W = \frac{pa}{70} \quad \ldots\ldots (4)$$

Conclusions on Moisture Measuring Apparatus.—Summing up the arguments of this chapter we see that for comparatively small quantities of moisture present in steam, the throttling calorimeter is the most accurate device for its quantitative determination. If, however, large quantities of moisture are present, two methods present themselves. Either we must first remove the major portion of the moisture by means of a separating calorimeter and later determine the remaining moisture content by means of the throttling calorimeter, or we must add a definite quantity of heat to the original steam supply by means of a device such as the Thomas Electric calorimeter and then determine with proper computation factors the moisture present by means of the throttling calorimeter.

As already shown the throttling calorimeter may be used up to moisture of 4 per cent for steam at 100 lb. pressure and up to a little over 5 per cent for steam at 200 lb. pressure. Most boilers deliver steam containing not more than 1½ per cent or 2 per cent of moisture so that for nearly all ordinary work the throttling calorimeter has sufficient range, and owing to its great simplicity and remarkable accuracy it is almost universally used. It is possible to make up a throttling calorimeter by means of pipe fitting by providing a disc within a pair of flanges having a small hole to act as the throttling agent; or the throttling may be done merely by partially opening the valve on the sampling nipple close to the main steam pipe. An extremely convenient design of calorimeter and one that can be readily moved from place to place is shown in the illustration. In this design a steam jacket is provided to prevent, as far as possible radiation losses from the calorimeter. For many further useful pointers and detail rules in ascertaining the moisture content of steam the reader is referred to the latest edition of "Steam" by the Babcock & Wilcox Boiler Company, and to the report of the Power Test Committee of the American Society of Mechanical Engineers which is to be found in Vol. 37, transactions A. S. M. E. for 1915, to which publications we are indebted for much of the information contained in this discussion.



A Suggestion for a Convenient and Compact Type of Throttling Calorimeter

The Sampling Nipple.—The American Society of Mechanical Engineers recommends a sampling nozzle made of one-half inch iron pipe closed at the inner end and the interior portion perforated with not less than twenty one-eighth inch holes equally distributed from end to end and preferably drilled in irregular or spiral rows with the first hole not less than one-half inch from the wall of the pipe. The failure to determine an average sample of the steam is the principal source of error in steam calorimeter determinations.

The installation of large Diesel engines have increased remarkably during the past year, due to the general rise in the cost of all fuels and the need for more motive power in the expansion of our industries. Wherever hydroelectric power is available, however, its advent has not been nearly so marked as in other localities.

SPARKS—Current Facts, Figures and Fancy

(In spite of the fact that fuel oil is costly and that hydroelectric development is constantly expanding in various sections of the West, the steam auxiliary reserve of practically every large central station is being enlarged, so keen is the call for new power on all sides. Below will be found many interesting items of recent trend in steam auxiliary design as well as other items of general information for the reader.—The Editor.)

It is estimated that a total in excess of half a million horsepower of new water wheel capacity was installed in hydroelectric plants during the last calendar year.

* * *

Big central station steam auxiliary plants are fast drifting towards the utilization of 250 deg. Fahr. superheat and pressures of not less that 250 lb. Already a power plant on the Pacific Coast is being installed to utilize 275 lb. pressure.

* * *

Where formerly steam velocities of two to three thousand feet per minute were commonly met with, we now find velocities as high as seventy-five hundred feet per minute and certain authorities are advocating velocities in excess of ten thousand feet per minute.

* * *

Steam meters on each boiler are of value, not only because they enable the operator to judge furnace conditions and thus operate more economically, but because their use make it possible to deliver a greater gross output from the station, as underloaded boilers can be found and loaded up.

* * *

For many years California has been, and still is, producing from 70 per cent to 80 per cent of the quicksilver yield of the United States. This metal is absolutely essential from a military standpoint, as there has not yet been produced a commercial substitute for it in the manufacture of fulminating caps for explosives.

* * *

In spite of the fact that the states of Arizona, New Mexico, Nevada and California can boast but four million in population, there exists no other section of the country where electrical utilization has a wider diversity of application, where more meters are installed per inhabitant, or where lower rates for energy or more economical generating costs prevail.

* * *

In a city of the West of three hundred thousand inhabitants, eighty-seven offenders in 1916 contributed over a thousand dollars in all for thefts of electric power. In no other line is the thief as liable to be caught and have to pay the consequences as in the stealing of this product in spite of the fact that the stolen goods bear no visible manifestation for possible detection.

* * *

Rare metals are coming to the front. Nickel-steel and chrome-nickel-steel we know in armor plates, and for the wearing parts of ore-crushing machinery and manganese steel is another tough favorite, often used in burglar-proof safes. Molybdenum and tungsten, too, have come into use and it is said that the rims of the great German howitzers are made with molybdenum steel. Another metal, very like tungsten, brought out in working radium ores, is uranium, and there has been considerable discussion over it.

* * *

Quite a few orders have recently been placed for steam turbines of 35,000 kw. capacity. Not only are turbines increasing in size, but they are working under higher steam pressures. The larger units with higher steam pressures, give greatest economies of operation. It is believed to be entirely feasible to design commercial boilers for 500 to 600 lb. pressures.

* * *

As an instance of the part that the electrical industry is playing in backing the national government financially the case of the General Electric Company may well be cited. This company has subscribed five million dollars to the Liberty Loan and has perfected a plan whereby employes may arrange to buy bonds on installments, independently of its own subscription.

* * *

In the new chemical building at the University of California it is planned to install apparatus by which nitrogen can be liquified and even helium reduced to a temperature where it will liquify—that is, to a temperature of only two degrees above absolute zero—only two degrees above the point when heat ceases to exist. Experiments along these lines have shown that electrical resistance ceases when a temperature as low as that of liquid helium is reached, and that an electrical current set going in a ring of metal will continue for weeks, instead of being used up by resistance, as it is at higher temperatures. What a wonderful saving in transmission of hydroelectric enenrgy could be accomplished under such temperatures!

* * *

Users of electricity for lighting are informed in Circular 55 of the United States Bureau of Standards that the tungsten lamp has been improved in quality and reduced in price to such an extent that no customer can afford to use carbon lamps, even if he were paid a bonus on each lamp for so doing. The bureau has continued to give its earnest approval of a wider use of the tungsten lamps as a measure of economy In condemning the useless consumption of current that is involved in the use of the old style of lamp the Bureau of Standards has considered the subject from the standpoint of each of the parties that are vitally interested—the users of lamps, the utilities that supply the current, and the state commissions and municipalities that regulate the utilities.

JOURNAL OF ELECTRICITY

FOUNDED 1897

PUBLISHED SEMI-MONTHLY BY THE

Technical Publishing Company

Crossley Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Secretary and Editor-in-Chief
E. B. STRONG, Jr., Treasurer
C. L. CORY, Director

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TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	" "	3.50
Other Foreign Countries within the Postal Union	" "	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office ten days in advance of date of issue. New advertisements will be accepted up to noon of five days prior to the dates of publication, which are the first and fifteenth of each month. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second class matter at the San Francisco Post Office

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The semi-annual index for Vol. XXXVIII, which is completed with this issue, will be sent upon request to any subscriber.

CO-OPERATION—NOT COMPETITION

In its last analysis competition means war and it ought to cease. To bring this about the development of the highest and truest spirit of co-operation attainable is absolutely essential. Let us remember, then, that co-operation in every human endeavor is the keynote of the hour. The spirit of co-operation and the spirit of the great West have ever been synonymous terms. Are you doing your part in missionary work to make this entire nation of ours one vast, throbbing, harmonious activity, whose foundation stone is democracy built upward from its broadminded citizenship by the all conquering spirit of co-operation?

Don't Economize but Synchronize

Frugal economy at the present stage of national affairs is foolhardy. Never were opportunities bigger or grander for the service of the nation and humanity than now. And in serving the nation and humanity the reflex action is bound to forward the financial status of the individual.

At the close of the civil war some said the proper solution of the negro problem was to send all the colored race back to Africa. Investigation showed that ships could not be built fast enough at that time to transport the negro babies being born, let alone return the adult population to its former abode. This country's wealth is now close to a quarter of a trillion dollars. The probabilities are, under the gigantic industrial and agricultural response of the nation to meet the world crisis that wealth is being created here at this present time faster than even the devastation of war can tear it down.

As an evidence of the confidence felt in affairs electrical, the recent happenings in Salt Lake City might well be cited as typical of activity in the West. After the declaration of war, in response to the president's message advocating increased industrial activity and efficiency, there was closed in Salt Lake City an electric sign contract calling for an expenditure of over ten thousand dollars, thus perfecting one of the largest single electrical sign contracts ever closed in the West.

When thoughtful men question in these days, their innermost feelings and emotions for guidance, the answer comes back that concerted effort which makes for true efficiency is the great need at present. That which tends to hoard finances or to hide the face in fear is intolerable. Extravagance and waste of every nature must be eliminated. Sane utilization of our resources is essential. Autocracy would endeavor to impell efficiency from above downward. Democracy breathes its activities from the human individual upward—free and unencompassed.

Let us put forth in the individual life of the nation more energy than ever before. And let us make this energy count for net returns. In a word—don't economize, but synchronize!

Prices for Governmental Supplies

There is much apprehension abroad as to the question of proper prices for governmental supplies. After all is said and done, true value is independent of fluctuation in market prices of gold or the cost of labor. In a word value is itself indestructible, unchangeable. The only difficulty that arises is to fix its proper relationship with the changing medium of exchange commonly known as the American Dollar, for value, like the hardy Flathead Indian of Montana, is never dismayed, never lost ("Injun no lost, tepee lost").

Much serious consideration should then be given at this time to the readjusting of this relationship and the suggestions offered in a recent issue of Collier's are most appropos.

A policy of low prices for supplies to the government would result in a crimped feeling, shrunken productions, a widespread spirit of discontent, lowering of wages in some lines causing intense feeling of unfairness, timidness on the part of capital, cessation of much development, retrenchment, and small if any war taxes. The government will buy supplies and raw material for other allied governments who in turn are known to be buying for private industries whereby we would be giving our foreign competitors an unfair advantage over American business.

Broad lines of constructive policy, which measure value according to its true worth will be one of the most helpful attitudes that can be assumed by those in responsible charge of the government.

Transformer Standardization

At the Riverside convention of the Pacific Coast Section, N. E. L. A., the report of the committee on standardization of transformers was not printed by request, owing to the desire that the National Society be allowed to present its report first.

Since this report has now been made, there will be found on another page of this issue a discussion of unusual interest to engineers and power companies throughout the West.

It is in the hope of improving manufacturing conditions, reducing costs and bettering deliveries that this standardization has been undertaken. Its results will be of great benefit. There are of course many conditions in the various systems where the standards adopted will not suit the conditions involved and it is not the intention that these recommendations shall in any way limit the use of special transformers.

The idea has been to standardize as much as possible and to give to the operating companies the results of quantity production that such standardization will bring about. It should be borne in mind that material benefit will accrue to the operating companies if logical standards are established and a conscientious effort made by all companies to encourage manufacture in keeping with the standards, and they therefore represent the ideal towards which to work in designing new systems and in making additions to or changes in existing systems.

The Electric Vehicle and the Truck

Recent informal discussion among men of the electrical industry throughout the West emphatically has brought out the fact that now is the opportune time to initiate a campaign that will produce far reaching effects in the more extended use of the electric truck and pleasure vehicle.

Those who have watched closely the evolution of the electric truck and pleasure vehicle during recent months and noted its constantly increasing popularity over certain of the fields of usefulness, hitherto evacuated under the terrific onslaught of the publicity campaign of the gas-operated car, have come to the inward conviction that throughout the West are to be found untold fields of usefulness for this activity of the electric manufacturer. Indeed immediate results await but the dissemination of these facts that are being daily brought to light.

A forceful instance of this lack of education and dissemination of recent accomplishments along these lines developed at the recent San Francisco Electrical Development and Jovian League. Among other interested men of the industry, one member, for so long a period known and beloved as the president of a well-known electrical supply house of the West, was asked to give his opinion of the electric truck and pleasure vehicle. The answer came quick and strong that while he was now the owner of seventy gas-operated cars, he reserved an electric car for his own individual pleasure and that in his former engagements in the electrical business the use of the electric truck proved beyond the question of a doubt to be far superior to the gas-operated car when dependability was to be taken into account.

The time has now come when the electrical industry itself demands the gathering together of facts that are being brought out in all districts of the West and that these facts be disseminated broadcast, for they will well bear the searchlight of investigation.

Some of the questions the business man wants to know from authoritative sources as brought out in recent discussions in the National Electric Light Association are the following:

"Are electric trucks used in any business like mine?"; "Who are some users that have proved the electric truck's value to themselves?"; "What sizes of electric trucks are made?"; "How much can they carry?"; "What size truck do I need in my business?"; "Who guarantees the operation of the batteries—the battery maker or the car maker?"; "What are upkeep costs compared with gas-car costs?"; "What are the operating costs compared with horse-drawn wagons?"; "How do I get the car charged?"; "What is the cost of a charging outfit?"; "Who will sell me a charging outfit."

Men of the electrical industry of the West must awaken to the necessity of collecting this information from this particular field—among the central stations, the universities—and disseminating it broadcast. And such bread cast upon the waters will surely return an hundred-fold in profitable sales by manufacturers and in the filling up of the valleys of central station loads throughout the West.

PERSONALS

A. A. Gray, general manager of the Electrical Review and Western Electrician, and **Chas. L. Benjamin,** formerly advertising manager of the Cutler-Hammer Manufacturing Company, have formed an alliance as counselors to technical and

trade advertisers under the firm name of Gray and Benjamin, with headquarters in Chicago. Few men have been more prominent in publishing and advertising circles during the past twenty years. The best wishes of the West go with them in their new venture.

E. T. Kavanagh, an electrical engineer at Mare Island, is a recent visitor at San Francisco.

E. J. Wallis, Pacific Coast manager Western Electric Company, has returned to San Francisco from Los Angeles.

J. S. MacPherson, general auditor of the Federal Sign System (electric), from Chicago, is a San Francisco visitor.

W. S. Berry, Pacific Coast sales manager Western Electric Company, is at Seattle, Wash., and expects to be at San Francisco on June 21st.

T. E. Bibbins, president of the Pacific States Electric Company, is expected to return to San Francisco from the East on June 15th.

B. A. Wagner, Pacific Coast manager Electric Agencies Company, has returned to San Francisco from an automobile trip to Los Angeles.

S. M. Kennedy, general agent and **A. N. Kemp,** comptroller of the Southern California Edison Company, are recent San Francisco visitors.

A. H. Halloran, vice-president and managing editor of the Journal of Electricity, is making an extended trip through Oregon, Washington and Idaho.

J. W. Wooley, secretary of the Oshkosh Manufacturing Company of Oshkosh, Wis., manufacturers of electrical construction materials, is visiting Pacific Coast points.

I. R. Soloman, formerly Los Angeles manager, has been promoted to manager of traffic and sales for the Gould Storage Battery Company, with headquarters at San Francisco.

Fred D. Baker, new business manager with the Sierra & San Francisco Power Company, has been commissioned as captain and quartermaster in U. S. Officers' Reserve Corps.

R. T. Guppy, formerly associated with the electrical engineering staff of the Southern Pacific Co. at San Francisco, is now with the engineering staff of the Southern California Edison Company in its new development work near Ventura, California.

C. E. Stevens, manager illuminating section of the supply division of the Westinghouse Electric & Manufacturing Company, and **L. A. S. Wood,** special representative of the Geo. Cutler Company, have been in California, Oregon and Washington during the past two weeks.

Bayard W. Mendenhall, formerly sales manager of the Utah Power & Light Company and more recently a manufacturer of Electrical specialties at Salt Lake City has left the electrical field to assume the management of the Salt Lake branch of Miller-Cahoon Company's automobile selling and distributing business.

Chas. H. Delany of the Pacific Gas & Electric Company, **Gaskel S. Jacobs** of the California Railroad Commission, and **Chas. A. Watts** of the Great Western Chemical Company, are assisting the University of California Extension Division in leading classes on heating and ventilation for various groups of steam fitters in Central California.

C. R. Young has been appointed sales manager of the Pacific Power & Light Company with headquarters in the Portland office. Though a comparatively recent graduate of Stanford University, Mr. Young's promotion comes as no great surprise to his many friends who are familiar with his tireless energy and effective application to work.

Ludwig Kemper, formerly manager of the Minnesota Gas & Electric Company, at Albert Lea, Minn., has been appointed president and manager of the Spokane Heat, Light & Power Company, at Spokane, Wash., succeeding **Harry A. Flood,** who has resigned as president, but remains as president of the holding company, and **E. Darrow,** who has resigned as manager.

Arthur H. Elliott, secretary of the Pacific Coast Electric Supply Jobbers' Association, and **W. L. Goodwin,** formerly vice-president and sales manager of the Pacific States Electric Company, now with the General Electric Company, in New York City, are receiving congratulations of a national flavor for their effective talks on co-operation at the recent national convention of the electric supply jobbers in the East

Francis I. Maslin of the electric distribution department of the Pacific Gas & Electric Company in Oakland; **Lieutenant Edward B. Strong, Jr.,** treasurer of the Technical Publishing Company, publishers of the Journal of Electricity, in San Francisco; **Allan W. Morrow,** of the engineering staff of the Standard Oil Company at Richmond, and **Chas. Z. Yost,** of the engineering staff of the Pacific Gas & Electric Company, in San Francisco, are among those who have recently taken unto themselves blushing brides.

OBITUARY

Arthur Gunn, president and manager of the Wenatchee Valley Gas & Electric Co., and the first president of the Northwest Electric Light & Power Association, was killed at Wenatchee, Washington, May 24, 1917, by the overturning of his automobile; it is thought that death was instantaneous. He was beloved by all who knew him and in the Northwest his loss is so keenly felt that the Northwest Electric Light & Power Association has issued cards of mourning expressing to the wife and children of Arthur Gunn the deep sympathy and condolence of its members.

TRADE NOTES

The Sangamo Electric Company of Springfield, Illinois, announce the opening of a San Francisco office at 37 Stevenson Street, in charge of L. A. Nott, district manager. This office will represent the Sangamo Company in Northern California and that part of Southern California not handled by the Sangamo Company's Los Angeles office.

The United Trading Company, recently incorporated by Max Loewenthal, formerly with the Dohrmann Commercial Company, Emil Greenebaum and Joseph Thieben, are western representatives of several eastern electrical manufacturers. These include the Menominee Electric Manufacturing Company, manufacturers of power motors, fans, bells, telegraph outfits, sewing machine motors, etc., the Pittsburgh Electric Specialties Company, making spotlights, drink mixers, vacuum cleaners, etc., the Swedish-American Telephone Company and the Ruvio Electric Company. Offices are at 595 Mission street, San Francisco, and 942 So. Hill street, Los Angeles.

MEETING NOTICES FOR ELECTRICAL MEN

(Two important events, one in the past two-week period and the other three weeks ahead, occupy the talk of men of the electrical industry in central California. The past event is that of the Alameda County Jovians and their recent successful entertainment, and the one ahead is the forthcoming meeting of the California Association of Electrical Contractors & Dealers at Santa Cruz, for which enthusiastic preparation is being made. In other parts of the West, meetings of interest to electrical men are being held. In the following pages items of interest along these lines may be found.—The Editor.)

The Alameda County Jovian Club

Men of the electrical industry in central California must take off their hats to the Alameda County Jovians for their wonderful ability at entertaining and creating friendly feeling among men of the industry. The first foreshadowing of the coming enthusiasm of this organization was shown on Wednesday, May 23 at the San Francisco Electrical Development & Jovian League when the San Francisco organization was taken by storm by men of Oakland, and the friendly way in which bids were given for the "get-to-gether" on May 30 was sufficient in itself to assure a large attendance.

On the evening set for the occasion the Alameda County Electrical Club, one of the many offshoots of the chamber of commerce, entertained 250 electrical men at their second annual smoker at the Hotel Oakland.

Pleasing to the electrical fraternity was the large attendance of "Jovians," over a hundred attending in a body from San Francisco. A splendid program, arranged by Messrs. Martinez, Kann and Woodward, sent the crowd away, happy and awaiting the time for the next affair. San Francisco promises in the near future to put on a Jovian night at the St. Francis Hotel, and will ask Oakland electrical men to be their guests. The electrical organizations in the bay cities are pulling together.

The electrical flag and the flashes of illumination exhibiting the wonders of Aladdin added much to the success of the affair.

BUILDERS OF THE WEST—VII

CHAS. C. MOORE

As long as children's prattle continues to picture the wonderful doings in fairyland, in Aladdin's Cave and the other host of wondrous happenings in the gorgeous imagination of the young, so long will the dazzling beauty of the Tower of Jewels, the splendor of restful setting backed by a glorious expanse of world-reaching waterway, continue to play in the descriptive imagination of the father, in his effort to transmit to the child, some conception of the inspiration that comes from a contemplation of the works of man as brought out in the great Panama-Pacific International Exposition at San Francisco in 1915. To Chas. C. Moore, brilliant executive and builder—this issue of the Journal is affectionately dedicated in appreciation of the ever-living service he rendered to the West as president of the Panama-Pacific International Exposition.

The California Association of Electrical Contractors & Dealers.

From July 11 to 14, 1917, the city of Santa Cruz will be in possession of the California Association of Electrical Contractors and Dealers for its 1917 Convention. Program for the meeting, which promises to be the largest of any yet held, is now being arranged. Subjects of importance to the various local sections all over the State are scheduled for consideration and discussion, among them universal adoption of trade acceptances; examinations for electrical men; practical newspaper advertising construction; essentials of cost accounting; every-day problems of the contractor and contractor-dealer; questions worrying the electrical retailer.

Men prominent in various walks of commercial life have already signified their intention of being present and addressing the gathering. The central station men are going to be on hand in larger numbers than ever, as will also the jobbers and manufacturers.

San Francisco Electrical Development & Jovian League

Wednesday, May 30, being the National Memorial Day and a public holiday no meeting of the league was held.

On Wednesday, June 6, was held the most largely attended and most enthusiastic meeting of the year. S. M. Kennedy of the Southern California Edison Company brought greetings from the south and in a fitting manner closed with a tribute to the ever-growing ideal of co-operation so noticeable among men of the electrical fraternity. Stanley Walton, of the Pacific Gas & Electric Company, as chairman of the commercial committee of the Pacific Coast Section N. E. L. A., outlined the proposed activities for the year, which are given in detail on page 445 of June 1st issue, Journal of Electricity. Dr. Thomas Addison, Pacific Coast manager of the General Electric Company, was speaker of the day and chose as his subject "The War's Effect on the Electrical Business." Dr. Addison, though eloquent and forceful in all his speaking in the past, was never more beautifully effective, than in his soul stirring remarks at this League meeting. E. O. Shreve, of the General Electric Company, acted as chairman of the day.

San Francisco Engineer's Club

The San Francisco Engineer's Club, held its weekly luncheon talk on Thursday, May 31st in the club rooms at the Mechanics' Institute Building. The program was given over to the Boy Scout movement. Several young scouts well exemplified the training acquired among the membership by exhibiting methods of bridge building, mapping and first aid treatment.

On Thursday, June 7, W. H. Shockley spoke on his travels with Mandarins in North China in 1897-1899. Mr. Shockley described in his own interesting way his personal experiences in an exploration party into northern China.

Los Angeles Jovian Electric League

Professor A. T. Atkins, psychologist, was the speaker at the May 23d meeting of the League. Prof. Atkins aimed to show that an analysis of an employe's mind by the psychologist is perhaps of greater import to the employer than a report on the body by a physician. His talk was illustrated by pictorial charts on phrenology. Several Jovian heads were carefully inspected with some startling discoveries, which served as a good object lesson to all present. Short talks were given by Cora B. Taylor and Elizabeth McManus on the subjects of public instruction and social service respectively. F. T. Maessen was chairman of the day and

his finish was an exceptional entertainment by Senor Serafin Pla, Grand Opera Baratone. The attendance was not large but very sympathetic.

Meeting of Electrical Council of Underwriters' Laboratories

The second meeting of the newly organized Electrical Council of Underwriters' Laboratories was held at the principal office and testing station at Chicago, Wednesday and Thursday, May 23 and 24.

L. A. Barley, Rocky Mountain Fire Underwriters' Association, Denver, Col., C. W. Mitchell, Board of Fire Underwriters of the Pacific, San Francisco, were in attendance.

The large and very representative attendance together with the interest displayed in all of the discussions furnish additional evidence of the important part which this Council is destined to play both in the electrical work of Underwriters' Laboratories and in the electrical industry as a whole.

A. I. E. E. Meetings

At the meeting of the board of directors of the American Institute of Electrical Engineers, held on May 18, information received from various sources indicated that, on account of the national situation, many active members of the Institute who usually attend conventions will not be able to spare the time to attend the scheduled four-day annual convention at Hot Springs, Va. Many of the Institute members have already received commissions in the Engineer Officers' Reserve Corps of the Army, and a large number are, or soon will be, rendering service to the government in various other capacities. The directors therefore voted to cancel the 1917 annual convention.

The directors also voted to hold an Institute meeting in New York, June 27 and 28, for the presentation and discussion of the papers that were to have been presented at the annual convention. Details of the program will appear later.

The following men in the West have been elected associates of the Institute:

Ralph B. Adams, telephone engineer, U. S. Forest Service. ..... Missoula, Mont.
Comer P. Altland, efficiency clerk, Pacific Gas & Electric Co. ..... San Francisco, Cal.
Clive Everett Baugh, electrician, Pacific Gas & Electric Company ..... San Francisco, Cal.
Halvor Willard Benneche, foreman station construction, Anaconda Copper Mining Co..... Great Falls, Mont.
E. E. Berg, system operator, Washington Water Power Co ..... Spokane, Wash.
Donald Joseph Russell Berkman, instructor in electrical and mechanical engineering, University of Santa Clara, ... Santa Clara, Cal.
John Tunison Brown, foreman, station constructing electricians, Pacific Gas & Electric Co.... San Francisco Cal.
Walter J. Dodge, engineer, Pacific Telephone & Telegraph Company ..... San Francisco, Cal.
Stephen E. Dunn, electrical student, University of California. ..... Berkeley, Cal.
John Winthrop Ellis, hydraulic operator, Mt. Whitney Power & Electric Co..... Hammond, Cal
Louis Grant Gomez, telephone expert, Public Utilities Commission of the State of Colorado..... Denver, Colo.
William King Hale, assistant to electrical engineer, Mountain States Telephone & Telegraph Co..... Denver, Colo.
Dean R. Hart, electrical mechanic, Washington Water Power Company ..... Spokane, Wash.
Roy Thorpe Hazzard, hydraulic operator, Mt. Whitney Power & Electric Co..... Hammond, Cal.
Edward Clinton Jansen, chief engineer, Colorado Power Company ..... Denver, Colo
Leo C. Johnson, electrical mechanic, Washington Water Power Company ..... Spokane, Wash.
Emil Albert Marklewitz, commercial engineer's office, Mountain States Tel. & Tel. Co..... Denver, Colo.
William Angus Mitchell, electrical engineer, Great Western Sugar Co. ..... Denver, Colo.
Tukuro, Nakagawa, chief engineer, Okumura Electric Co.; lecturer Kyoto Imperial University..... Kyoto, Japan
Louis Joseph Nevraumont, operator, Pacific Gas & Electric Company ..... San Francisco, Cal.
Joseph Barstow Nichols, superintendent, Paulsen Building ..... Spokane, Wash.
Bernhard Olsen, sales agent, General Elec. Co.. Spokane, Wash.
W. P. L'Hommedieu, manager Railway & Lighting Div., Westinghouse Electric & Mfg. Co..... San Francisco, Cal.
Barrett Morris Merrill, assistant superintendent Light & Power System, Wash. Water Power Co.... Spokane, Wash.
Royal Daniel Sloan, instructor in electrical engineering, Montana State College..... Bozeman, Mont.
Harold Nelson Walker, electrical engineer, Washington Water Power Co..... Spokane, Wash.
George I. Wright, foreman substation construction, Southern Pacific Co..... Portland, Ore.
Roy Conrad Zoll, electrical tester, Bureau of Power and Light, City of Los Angeles..... Los Angeles, Cal.

Congress of Engineers of Norwegian Birth

An informal congress and re-union of American and Canadian engineers and architects of Norwegian birth or descent, is to be held in Chicago from Thursday, September 27th, to Saturday, September 29th, 1917, at Chicago Norske Klub, 2346-2350 North Kedzie boulevard, Logan Square, Chicago, U. S. A.

National Convention of Electrical Supply Jobbers

At the concluding sessions of the meeting of the Electrical Supply Jobbers' Association at Hot Springs, Va., last week, inspirational and thoughtful addresses were made by Arhur H. Elliott of Oakland, Cal., secretary of the Pacific Division of the association, and W. L. Goodwin, formerly vice-president and sales manager of the Pacific States Electric Company and now with the General Electric Company in New York City. The former told of electrical commercial conditions on the Pacific Coast in a very interesting manner. The latter spoke of his recent work among the jobbers and contractors in New York City, and the situation he unearthed came as a revelation.

Mr. Goodwin's reputation as an organizer and the excellent work he did for the electrical industry on the Pacific Coast are very well known, so that his remarks were listened to with a great deal of attention.

A Benefit Plan for Jovians

A new benefit plan for Jovians has been effected for the Jovian Order as follows:

No. 1. Any Jovian in good standing may by application to the Jovian Central office now secure accident insurance, substantially identical with the twenty-five dollar policies issued by the three largest accident companies, upon payment of a premium of only twelve dollars,—net saving thirteen dollars.

No. 2. Or, in the same manner a Jovian may secure health insurance of a market value of thirty-five dollars for twenty dollars—net saving fifteen dollars.

No. 3. Or, one accident and one health policy,—net saving twenty-eight dollars.

No. 4. Or, two accident policies,—net saving twenty-six dollars.

No. 5. Or, two accident and one health policy,—net saving forty-one dollars.

NEW BULLETINS

Sandstone quarrying in the United States is discussed in a very useful and helpful manner in bulletin 124 of the U. S. Bureau of Mines, just issued.

New bulletins of the Crocker-Wheeler Company are No. 177 entitled "Form W Rolling-Mill Motors" for 220 or 230 volts, direct current in sizes from 6½ to 200 h.p. and No. 178 entitled "Three-wire Distribution" which sets forth the advantages and methods to be followed in this system of distribution.

"Booklet E" is the title of the new 32-page booklet just published by The Cutler-Hammer Mfg. Company, Milwaukee, describing C-H Control Equipment for Electric Elevators. This booklet covers the various classes of control, such as hand rope control, car switch control, push button control, for all classes of freight and passenger service.

The General Electric Company has just issued Bulletin No. 43503 on "The Application of Novalux Units to Ornamental Street Lighting." The bulletin is attractively prepared, containing 36 pages fully illustrating the correct lighting units for business streets, residential streets and outlying districts.

Excellent bulletins on poultry as a means of conserving the food supply, and irrigation of rice in California have recently been issued by the college of agriculture of the University of California. Other useful pamphlets are entitled: Drying winter vegetables, canning fruits without sugar, preservation of fresh eggs, and preservation of vegetables by salt and fermentation.

OF INTEREST TO UTILITY COMPANIES

(Reorganization of the Southern California Edison Company in its personnel is one of the striking features of the past semi-monthly period. Financial notes, increase of dividends, extension of service, and a statement of increase accounts constitute other items of interest to utility companies throughout the West, briefs of which may be found on this page.—The Editor.)

Reorganization of Southern California Edison Company

The consolidation effected by the Southern California Edison Company and the Pacific Light & Power Corporation has been completed in its various details, and at a special meeting of the new board of directors the following officers were elected: President John B. Miller; vice-president and general manager, W. A. Brackenridge; vice-president and assistant general manager, R. H. Ballard; other vice-presidents, George C. Ward, formerly vice-president of the Pacific Light & Power Corporation, George I. Cochran, J. C. Drake and William R. Staats; general counsel, H. H. Trowbridge; general agent, S. M. Kennedy; comptroller, A N. Kemp; treasurer, W. L. Percey; secretary A. E. Morphy; general superintendent of the southern division, B. F. Pearson; general superintendent of the northern division, E. R. Davis; purchasing agent, John Otto; assistant comptroller, D. M. Trott; assistant treasurer, B. T. Story; auditor, C. P. Staal.

The new board of directors is composed of John B. Miller, H. E. Huntington, W. A. Brackenridge, Albert W. Harris, W. E. Dunn, George I. Cochran, J. C. Drake, William R. Staats, Arthur H. Fleming, Henry M. Robinson, J. H. Fisher and Howard E. Huntington.

Connecting the two physical systems and merging of the two operating departments will be undertaken at once and will be completed within the next few months.

Great Western Power Company

Great Western Power Company, operating in Oakland, Petaluma, Santa Rosa, Napa, Rio Vista, Sacramento, Berkeley, Richmond and various other small towns, has reported to the Railroad Commission the following figures:

Income Account

Operating revenue	$2,898,818.38
Operating expenses	760,075.32
Net operating revenue	$2,138,743.06
Non-operating revenue	252,337.98
Gross corporate income	$2,391,081.04

Deductions

Non-operating revenue	$ 24,479.80
Interest on funded debt	1,085,200.00
Other interest	7,885.33
Rent	295,633.17
Total	$1,432,623.40
Net corporate income	958,657.64
Dividends	357,500.00
Miscellaneous additions	129,593.34
Miscellaneous deductions	1,419,474.75
Surplus, December 31, 1915	1,668,545.37
Surplus, December 31, 1916	979,821.60

The Pacific Gas & Electric Company

At the recent annual meeting of stockholders of the Pacific Gas & Electric Company, San Francisco, A. F. Hockenbeamer, vice-president and treasurer, showed that, notwithstanding the cessation of the temporary exposition revenue of 1915, the gross business in 1916 increased $85,000 over the total of 1915.

Regarding the new development work on the Pit River announced in the last issue of the Journal of Electricity, the present construction schedule calls for the following expenditures: First year, $300,000; second year, $1,500,000; third year, $2,000,000; fourth year, $7,000,000; fifth year, $6,700,000; total, $17,500,000. Waterwheels and generators are to be purchased last so as to afford the advantage of such improvements in design as may take place.

Dividend of Montana Power Co.

The Montana Power Company has declared a quarterly dividend of 1¼ per cent on common, and a regular quarterly dividend of 1¾ per cent on preferred, both payable July 2 to stock of record June 15. This places common stock on a 5 per cent annual basis, compared with 4 per cent heretofore.

Extension of Washington Power Co. Service

The Washington Water Power Company, Spokane, Wash., is negotiating with mine operators in the north side of the Coeur d'Alene region to furnish power for the operation of mines and mills. Line construction and transformer installation would involve an expenditure of $50,000, according to M. C. Osborn, commercial agent for the company. The lines would total 25 miles. Extensive development of properties in that region has been retarded by lack of power.

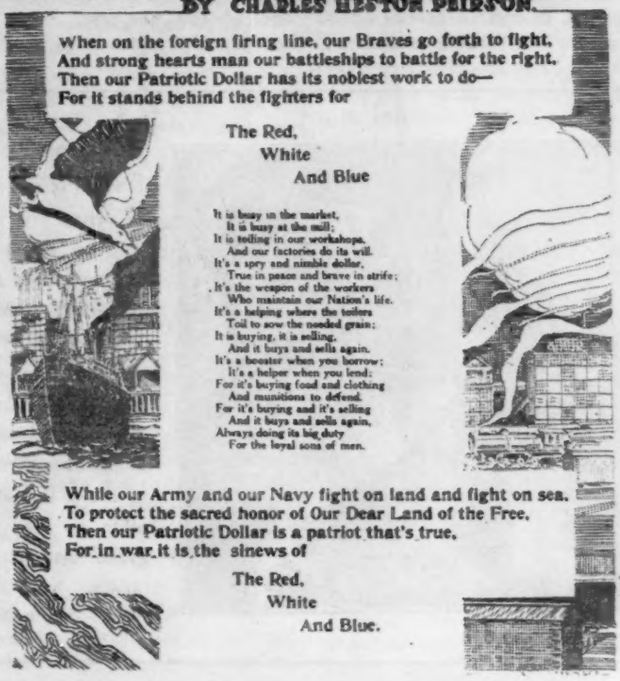
Northwest Electrification Progressing

That part of the Chicago, Milwaukee & St Paul Railroad between Harlowton, Mont., and Avery, Idaho, a distance of 437 miles, is now being operated as an electric line. Electric power is supplied by various plants of the Montana Power Company, the largest two of these being at Great Falls, Mont., and Thompson Falls, Mont. The first electric train was moved in December, 1915, and the last steam-operated train was taken off the Missoula division in February, 1917. On that division is the St. Paul Pass tunnel, which cuts through the summit of the Bitter Root mountain range near the Montana-Idaho line, and has a length of 8000 ft. This was concrete lined throughout before the line through it was electrified.

The work of electrifying another division, of 217 miles, began about May 16, 1917. The starting point is at Othello,

Our Patriotic Dollar

BY CHARLES HESTON PEIRSON.


When on the foreign firing line, our Braves go forth to fight,
And strong hearts man our battleships to battle for the right,
Then our Patriotic Dollar has its noblest work to do—
For it stands behind the fighters for
The Red,
White
And Blue
It is busy in the market,
It is busy at the mill;
It is toiling in our workshops,
And our factories do its will.
It's a spry and nimble dollar,
True in peace and brave in strife;
It's the weapon of the workers
Who maintain our Nation's life.
It's a helping where the toilers
Toil to sow the needed grain;
It is buying, it is selling,
And it buys and sells again.
It's a booster when you borrow;
It's a helper when you lend;
For it's buying food and clothing
And munitions to defend.
For it's buying and it's selling
And it buys and sells again,
Always doing its big duty
For the loyal sons of men.
While our Army and our Navy fight on land and fight on sea,
To protect the sacred honor of Our Dear Land of the Free,
Then our Patriotic Dollar is a patriot that's true,
For in war it is the sinews of
The Red,
White
And Blue.

AN INSTANCE OF UTILITY SERVICE IN MAINTAINING PUBLIC CONFIDENCE

Here is a forceful instance of how utility companies of the West are assisting in injecting optimistic publicity in the newspapers and thus counteract a tendency to economize or to "put coin in the tenpot," which is apt to occur as a result of increased cost of staples and war taxes.

100 miles east of Cle Elum. The electrification will proceed westerly to Seattle and Tacoma. The character of construction will be the same as that on the Rocky Mountain division. There will be eight substations, at Taunton, Doris, Kittitas, Cle Elum, Hyak, Cedar Falls, Renton and Tacoma. Power will be furnished by the Intermountain Power Company. It is figured that the work will be completed between Cle Elum and Seattle and Tacoma before the close of 1918. This work is in direct charge of R. Beeuwkes, electrical engineer.

California Commission Notes

The Key Route Company, which operates extensive interurban lines out of San Francisco, recently asked the Railroad Commission to give it a rate hearing, declaring that it wants to raise its passenger fare for ferry and interurban service on the ground that the present rates are too unreasonably low to return the company a fair interest on its investment. The petition asserts that the value of the operative property devoted exclusively to the service mentioned is $8,304,104, and that its total earnings from this source for the sixteen months past were $1,595,043. Its operating expenses and taxes were $1,336,893, leaving net earnings of $258,150. Bond interest and fixed charges are set down at $485,598, leaving a deficit of $227,447. The applicant adds to this a special charge of $237,442 for the abandonment of an old pier trestle and puts down a total deficit of $489,071 for sixteen months' operation of the Key Route ferry service and local lines.

As a general proposition, the commission decided that while the company at present was not earning a fair return on its investment, it felt that the main reason for this was the competitive condition that existed and, inasmuch as the Portland company was not meeting its competitor's rates, it could not put forward the excuse that it was not getting a fair return.

The California-Oregon Power Company is seeking in the United States Court an injunction against city officials of Klamath Falls, Ore., to prevent them from submitting an ordinance on the June ballot granting a franchise to a competing electric light and power company. The company alleges that the proposed franchise cannot be legally placed on the ballot because it was prepared in violation of the city charter. It is further declared that the cost of the election would add to expenses of taxpayers, of which it is one of the heaviest. The Keno Power Company is the concern that wishes to enter the field.

THE POWER OF VISUAL INSTRUCTION

Here is an instance of how the psychology of visual instruction is made use of to make a deep imprint upon every beholder. In this window display, the very romance of life itself is made to set forth the on sweeping victory of electrical applications. The educative value of visual instruction is coming more and more into prominence among our great institutions of learning. Utility companies throughout the West will do well to make use of its value in every way possible as was done in this instance by a great utility company in Southern California.

Public Service Commission of Oregon

In a decision handed down on May 21, the Public Service Commission of Oregon ordered a reduction in the light and power rates of the Portland Railway, Light & Power Company.

This decision came as a result of a succession of investigations, valuations and hearings that have been held during several years past. The reduction on domestic lighting will amount to between 10 and 15 per cent, or from $60,000 to $65,000 a year, according to estimates made by the commission. If the Northwestern Electric Company, a competitive concern, meets the new rates, another $10,000 or $12,000 a year will be cut off from the domestic service charges in Portland.

The Portland Railway, Light & Power Company has announced publicly that it will accept the rates, although it is thought that they will work some hardship on the company. It is not yet apparent that the order applies to the rates of the Northwestern Electric Company.

Western States to Spend a Million

Western States Gas & Electric Co., a subsidiary of the Standard Gas & Electric Co., is to enlarge its hydroelectric generating plant on the American River, nine miles above Placerville, Cal., and expects to eventually increase the present 8,000 horse-power capacity to 40,000. Additonal water storage is necessary, and the company has filed with the California State Water Commission an application to be allowed to add 20,000 acre feet to the storage capacity of the three lakes situated above the plant. Ultimately the company plans to spend $1,000,000 on this enterprise.

RECORD WESTINGHOUSE EARNINGS

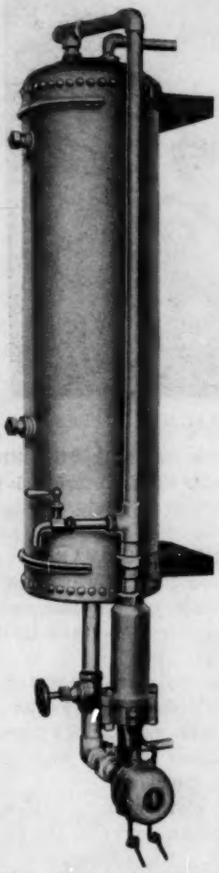
Never before in its history has the Westinghouse Electric & Manufacturing Co. been able to report so prosperous a period as the twelve months ended March 31. Gross sales were $89,539,442, against $50,269,240 last year, and after charging off $6,473,066 for depreciation and betterments, paying $768,348 interest and adding $1,386,547 there remained $18,079,888 applicable to dividends on the capital stock outstanding. This was equal to $15.10 on each $50 share then outstanding, against $8.53 in the previous fiscal period. About the close of this year, however, the company sold an additional $15,000,000 in common stock, bringing the amount to $70,813,950, which with the preferred, makes $74,812,650 capital stock now issued. Earnings on this amount of stock in the recent fiscal year equal $12.09, against dividends of $3.50 per annum on both classes.

LATEST IN EVERYTHING ELECTRICAL

(The recent report of the sub-committee on electric water heating for the National Electric Light Association gives a most comprehensive resume of the present status of electric water heating. In this report the Pacific Coast States are seen to take a most enviable lead in their development and use. Below are summarized the salient features of this report and two types of electric heaters there described are appended in this discussion. Other items of recent advance in affairs electrical follow this article.—The Editor.)

PRESENT STATUS OF ELECTRIC WATER HEATING

Electric hot-water service is of vital importance to the introduction of the electric range. Electric ranges are sold on account of greater convenience, cleanliness and safety; it is therefore inconsistent to recommend other methods of water heating, especially since electric water heaters are as far superior to other heaters as electric ranges are to other types. When a central station fails to push electric water heating along with electric cooking it has neglected one-half of the possible revenue from each installation. Further, the load factor of the water heater is far superior to that of the range, and is accordingly entitled to a much better rate.



New Circulating Type of Electric Water Heater

To make water heating successful, four things must be taken into consideration: First, the rate; second, the selection of the heater; third, the proper installation of the heater; fourth, the proper insulation of the storage boiler. With these matters properly handled every installation will be successful.

The report records the number of heaters installed and the connected load as follows:

	Heaters Installed	kw. Connected
Pacific Coast States.	2005	2455
Middle States.....	58	33
New England States.	81	243
Total	2144	2731

One station reports the average consumption of water heaters only at 103 kw.-hr. a month, revenue $3.65; range only as 102 kw.-hr. a month, revenue, $3.85; range and water heater combined 242 kw.-hr. a month, revenue $6.65.

Five types of water heaters are now available. They are the instantaneous, automatic circulation, non-automatic circulation, automatic immersion and the non-automatic immersion.

The matter of boiler insulation is of the utmost importance on account of the large radiation losses from uninsulated boilers.

The Thermal Switch

Any circulating-type water heater properly constructed, with the resistors and insulating material now available will give satisfactory service as long as the heating unit is in proper contact with water. Any water heater properly installed with the thermal insulation necessary to high efficiency will fail when the following conditions obtain.

When the heater is allowed to operate until the water is heated to the boiling point and steam, which displaces the water in contact with the heating unit, is generated.

When the circulating pipe, heater or flow-restricting device becomes choked or filled with sediment or scale.

In both cases the conduction of heat from the element is retarded and the temperature rises sufficiently to cause either the insulation or the resistor to fail. Any device designed to limit satisfactorily the temperature of both water and heater will not only insure against heater failures but will add much to the convenience and service of electric water heating.

A thermal switch designed to open and close the heater circuit at predetermined temperatures of the water and arranged to be used in connection with any standard make of circulating-water heater is now giving satisfactory service in many installations. A brass fitting is placed in the circulating pipe just below the heating device. One side or face of this tee is recessed to receive a temperature pressure cell, which is held in close contact with the tee by means of screws that also support the switch contacts and case. This pressure cell is constructed by welding a spring diaphragm to a copper cup. The cell is partially filled with a liquid that has the required boiling point and is then sealed. The contacts are arranged to close by gravity; the upper contact is supported by the movable arm, pivoted, and so adjusted, with regard to the diaphragm of the temperature cell, that the contacts are instantly forced apart a sufficient distance when the temperature reaches the proper point. When the temperature of the tee or fitting is reduced, the pressure cell diaphragm moves back and the contacts instantly close.

This pressure cell is easily replaced and cells of different temperature adjustments can be furnished. The contacts show only slight depreciation when used with water heaters up to and including 6 kilowatts, 220 volts.

When constant hot water service is desirable, efficient thermal insulation is most necessary, and the thermal switch should be so placed in the circulation pipe that any displacement of water by steam or air in the water heater will cause the switch to open. By using a low temperature adjustment and placing the switch as close as possible to the inlet end of the heater with the restriction or flow retarding device on the outlet or hot end, any obstruction in the circulating pipe will cause hot water to be forced into the switch fitting causing the switch to open the circuit.

When the hot water in the storage tank reaches the bottom and passes into the circulating pipe the switch will open. If water is drawn from the tank the switch will at once close and will open again only when the tank is full of hot water or the circulating pipe is closed.

Instantaneous Water Heaters

Two factors have retarded the application of the instantaneous water heater. No method has been provided to limit the current rush the instant the heater is started. This of course results in a pronounced disturbance on the line, which proves very annoying to the lighting customers served from the same transformer or service bus.

The second factor is as serious, but affects only the person who depends for hot water upon a heater using metal

elements. If for any reason the supply of water passing through a heater with a metalic element fails to flow while in use, the temperature of the element becomes so great that damage results and the element is destroyed and requires replacement, which is not only expensive but annoying to the user.

In the designing of the instantaneous heater shown both of the objectionable features mentioned in the preceding paragraph have been overcome. The new electric faucets are of the automatic type and, owing to a radical change in design, the faucet accomplishes its function to a high degree of perfection and efficiency. It is automatic and as nearly fool proof as human ingenuity can make it. The electric switch has been dispensed with entirely and the flowing water makes the electrical connections. Since the water enters at the bottom of the electrodes and rises to the top, the space between the electrodes is gradually filled, thus slowly increasing the current from zero to maximum, and when the water is shut off it gradually drains from the heater reducing the current back to zero in the same manner, thus entirely eliminating the sudden surges so common to the coil type of instantaneous heater. If the water supply should be cut off, no electricity will flow when the faucet is operated, therefore no burn-out can occur. The insulation of the current carrying parts has been given close study and as a result the break-down voltage is 18,500 volts. This insures perfect safety against danger from fire or shock to persons operating the faucet.

Simplicity, which is the keynote of all successful devices, is a marked feature of this appliance, there being practically only four parts, the faucet, the container, and the two carbons which carry the electric energy. The terminals for connecting to the service outlet are brought out at the base where it is screwed to the water pipe. A carbon cylinder and rod shown in the illustration of parts are in turn electrically connected to these terminals and tap water flowing up between both electrodes completes the electric circuit. Thus it is seen that the rate at which the water is heated depends solely upon its rate of flow through the passage between the two carbon electrodes. The nickel cap, enameled on the inside, covers the electrodes and forms a passage for the water to the discharge nozzle. The cap is an electric insulator requiring 8000 volts to break down. Water of almost any temperature up to boiling can be obtained instantaneously. The efficiency is practically 100 per cent, the entire electric energy being transformed into heat.

The passage of the electric current through the water acts as a germicide, and bacteria which are contained in all waters are reduced to a minimum. Another great advantage of this heater is that only one faucet is required for an ordinary lavatory; both hot and cold water can be drawn by the simple operation of turning the handle in one direction for hot water and in the reverse direction for cold.

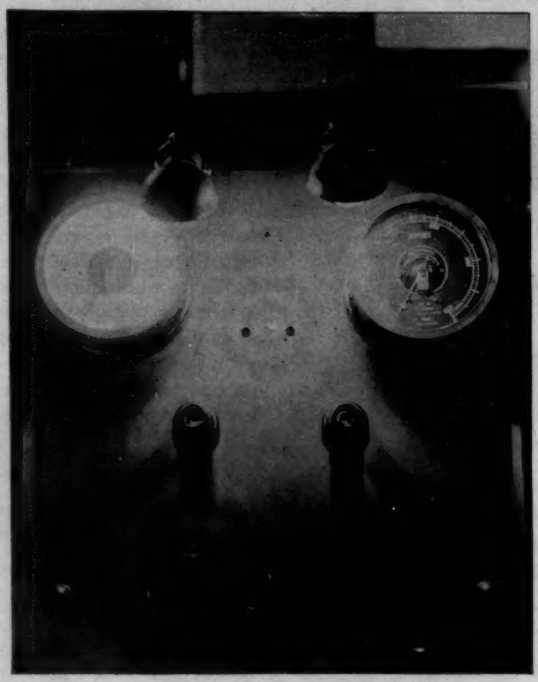
With a large number of these faucets on a central station line, the diversity factor is such as to very slightly increase the total demand on the system or on any single transformer supplying a number of the heaters. While the faucet was primarily intended for the home, it will be found very useful for barber shops, saloons, soda fountains, and in commercial establishments requiring hot water instantaneously.

New Circulating Type of Heater

The principle of this instantaneous heater and of the Kercher thermal switch as hereinbefore described, has been utilized in a new circulating type of electric water heater manufactured by the Automatic Electric Faucet Company Hobart Building, San Francisco. The electrodes can be charged for any current consumption between 800 and 8000 watts. The heater can be quickly attached to any hot-water boiler, has a high thermal efficiency and is made of indestructible material. It represents the last word in electric water heating.

BLACK DIAL TYPE ELECTRIC METERS

Electric meters having black dials with the figures, scale, and pointer in white, were first brought out by the Westinghouse Electric & Manufacturing Company for cab service on electric locomotives. The object in using this type of



The Black Dial Type of Meter

instrument, was to prevent the glare caused by the illumination of white-dial meters in tunnels, which interfered with the reading of signals.

POPULARITY OF ELECTRIC TABLEWARE

Everyone interested or associated in any way with the electrical industry has doubtless observed the phenomenal increase in the use of electric current for other than lighting purposes in the home.

The off-peak load resultant from the more extensive use of electric home conveniences is very gratifying to the central station manager. And electric tableware, which because of its additional use during the summer months when little electric light is used, is chief among the list.

From a merchandising point of view, electric tableware is easy to sell. The idea of "cool cooking" right on the dining or breakfast table appeals quickly. Its advantages, convenience and neatness meet with immediate approval. The fact that most electric current users do not use the maximum for which they are paying during the summer months and that they may enjoy the benefits of electric tableware by using this current without additional expense, quickly sells these appliances.

In the matter of popularizing the use of electric home conveniences, too much credit can not be given the world's largest exclusive manufacturers of electric appliances, the Hotpoint Electric Heating Company of Ontario, Cal. This company is credited with being one of the leaders in improving the serviceability and convenience of electric appliances.

CONDENSITE PATENT RECOGNITION

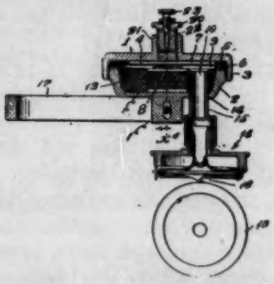
Pending litigation between the Condensite Company of America and the General Bakelite Company has been terminated, and as a result of the settlement the General Bakelite Company agrees to recognize the validity of the Condensite (Aylsworth) patents Nos. 1,065,495, dated June 24, 1913 and 1,137,374, dated April 27, 1915, and to pay substantial royalties thereunder.

WHAT WESTERN INVENTORS ARE DOING

(Many inventors have attempted to utilize electrically transmitted impulses. The field is a broad one and a successful invention would undoubtedly result with much profit to the inventor and vastly forward all phases of radio activity. Below will be found a brief on a recently patented means for utilizing electrically-transmitted impulses as well as patents for a portable electric water-heater, a train-stop and signaling system, a telephone transmitter and mouthpiece, and flash-light apparatus—all by inventors in the West.—The Editor.)

1,225,203. **Means for Utilizing Electrically-Transmitted Impulses.** Edward H. Amet, Redondo Beach, Cal.

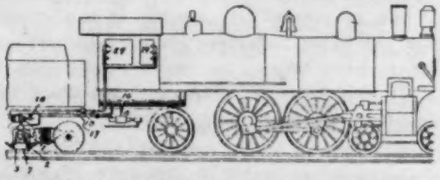
The combination with a telephone receiver diaphragm and electro-magnetic means for operating the diaphragm, of



dash-pot forming means containing air open to atmospheric pressure, means to regulate the size of the chamber, and means to nearly close the opening to the atmosphere.

1,225,508. **Train-Stop and Signaling System.** Hiram G. Sedgwick, Mill Valley, Cal., assignor to The National Safety Appliance Company, a corporation of California.

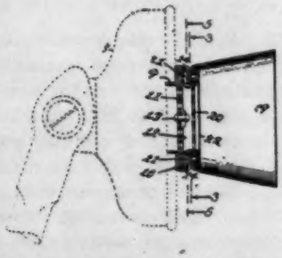
A combination with a railway vehicle, two sets of armatures carried thereby, one set being arranged at each side of the center of the vehicle, two groups of train control devices,



means operated by one set of armatures while the train is going in one direction to actuate the devices of one group and means operated by the other set when the train is going in the opposite direction to actuate the devices of the other group and means to operate each armature independently of all the other armatures.

1,225,672. **Telephone Transmitter and Mouthpiece.** Hitasu Nakai, Havre, Mont.

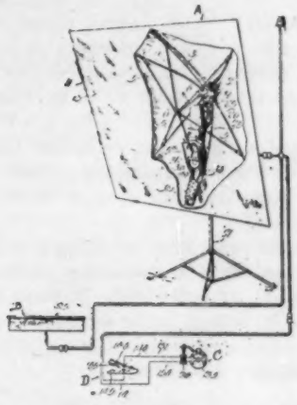
The combination with a telephone transmitter provided with a threaded opening for a mouthpiece, of a casing pro-



vided with a threaded neck engaged in the opening, a mouthpiece in detachable engagement with the casing, and means for preventing the use of the telephone operable by the removal of the detachable mouthpiece.

1,225,261. **Flash-Light Apparatus.** David Charles McCandless, Boise, Idaho.

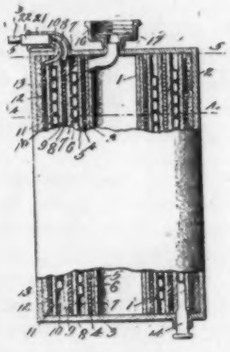
In an apparatus for photographing by artificial light, the combination of a base member composed of upper and lower sections hinged together, a powder pan mounted on the upper section and having in its bottom an opening, a pair of spaced



terminals on the lower section for reception in the opening when the upper section is lowered, the terminals being adapted to be connected by a fuse, and means for supplying electric current to the terminals for blowing the fuse to ignite the contents of the pan.

1,225,631. **Portable Electric Water-Heater.** Clarence E. Hinkle, Roswell, N. Mex.

An electrical water heater including an inner core, an outer casing, a series of sets of electrically insulated resistance units and heating coils disposed between the core and



casing, the coils having a common inlet and common outlet, means for connecting the resistance wires with a source of electric supply and electrical insulating material between the coils and resistance units, said material permitting the free transportation of heat.

NEW ELECTRICAL DEVELOPMENTS

(The continued public confidence manifested in utility securities constitutes the most substantial advance in electrical development during the past semi-monthly period. That these securities are becoming more and more to be recognized as excellent investments for savings banks may be seen from the first news item set forth below. Other jottings of new electrical developments throughout the West follow.—The Editor.)

FINANCIAL

STOCKTON, CAL.—Samuel Kahn, vice-president and general manager of the Western States Gas & Electric Company, received word that W. R. Williams, State Superintendent of Banks, has approved the Western States Gas & Electric Company's bonds as legal securities for the investment of savings banks.

INCORPORATIONS

LATON, CAL.—The Laton Telephone Company has been incorporated.

GRASS RANGE, MONT.—The Grass Range Farmers' Telephone Company has been incorporated here.

SEATTLE, WASH.—The Skokomish Power Company has been incorporated for $1,000,000 by G. H. Tilden, W. H. Wynn Jr., H. Bunker.

FRESNO, CAL.—The Laton Telephone Company has been incorporated. The incorporators are I. Tellman, T. D. Maryhall and A. G. King. It will operate in Fresno and Kings counties.

TEMPE, ARIZ.—Articles of incorporation have been filed by the Power, Light & Operating Company. The incorporators are E. H. Winkler, Wm. F. Ballard, Chas. E. Ballard and Jas. E. Strikham, all of Oklahoma City, Okla. The principal place of business in the state of Arizona shall be at Phoenix. Capital, $1,000,000.

ILLUMINATION

MESA, ARIZ.—The voters of Mesa have decided to purchase the plant of the South Side Gas & Electric Company.

ELK RIVER, IDAHO.—The town of Bovil will vote on June 9th on an issue of $5500 in bonds for the construction of an electric plant.

PALOUSE, WASH.—At a special election held at Deary it was voted to bond the town for the purpose of installing a municipal electric lighting plant.

PALOUSE, WASH.—At a special election held at Deary Tuesday it was voted to bond the town for the purpose of installing a municipal electric lighting plant.

LODI, CAL.—The Lodi Business Men's Association has accepted the design of City Engineer Barzellofti for the type of concrete electroliers to be used in the residence districts.

DOUGLAS, ARIZ.—An ornamental lighting system is to be installed in the Tenth Street City Park. The council has instructed the city clerk to advertise for bids for the work.

RIVERSIDE, CAL.—A resolution of intention has been passed by the common council for the improvement of Chestnut street from Sixth to First street, and lighting the sidewalks from Eighth to First street.

VENTURA, CAL.—There is a movement on foot here to bring about ornamental street lighting to replace the present primitive system now in use. Oxnard and Fillmore have decided on installing such a system.

SALINAS, CAL.—A resolution of intention has been adopted by the city council for the installation of an electrolier lighting system consisting of 45 electroliers, on Main, Market, North Main and Sausel streets.

COLUSA, CAL.—The trustees have awarded a contract to the Pacific Gas & Electric Company for furnishing light to the city for a term of three years. Provision is made for the installation of a number of additional lights to be scattered throughout the city.

SANTA BARBARA, CAL.—An ordinance has been adopted by the board of supervisors granting the Midland County Public Service Corporation a franchise to lay and maintain a system of gas pipes and to distribute gas along certain highways of Santa Barbara County.

SACRAMENTO, CAL.—A total of 18 cities in the state own their own light plants and these plants earned $842,636.05 in 1916, according to data regarding the earnings of municipally-owned public utilities and their value given in the annual report of the State Controller.

LEWISTON, IDAHO.—An ordinance has been passed by the city council granting the Washington-Idaho Water, Light & Power Company a franchise for a period of 25 years, to construct and maintain within the limits of the city of Lewiston, poles, wires, underground conduits and other structures and the right to furnish power and light.

HUNTINGTON BEACH, CAL.—The board of trustees has awarded a contract for the installation of reinforced concrete gas lighting posts, fitted with gas lamps, brackets, etc., together with the installation of iron pipe conduits and all the accessory fixtures on Main street from Summit avenue to Ocean avenue, to Leigh G. Garnsey on his bid of $13,497.50.

LOS ANGELES, CAL.—To procure for Hill street an ornamental lighting system similar to that to be installed on Broadway and to secure the opening of the street between Washington and West Jefferson, property owners and lessors on the streets have formed an improvement organization of which F. R. Feitshans is temporary president and James Webb temporary secretary and treasurer.

SEATTLE, WASH.—Bids will be opened by the board of public works on July 20 for a $3,000,000 addition to the city light and power system in the shape of a hydroelectric power plant complete with transmission line. The plans provide for a plant capable of delivery in Seattle of 25,000 kilowatts for a period of 5 hours, 10,000 kilowatts for a period of 19 hours and 13,000 kilowatts continuously.

OTHELLO, WASH.—The council met in a special session Monday evening for the purpose of outlining the proposed plan to bond the town of Othello to enable the city's attorney to prepare the legal formalities required for the submitting of the bonding proposition. If the voters authorize the issuance of bonds the town will put in an electric light plant and extend the present water system.

YUMA, ARIZ.—F. E. Trask, a consulting engineer of Los Angeles, has submitted his report to the city of Yuma, Arizona, in which he estimates the cost for a complete new water, light and gas system for that city at a cost of $363,987.52. He also made valuations of the existing water, light and gas plants and found the present value of the physical property to be $162,420.25. He has recommended to the city that a bond issue of $300,000 be made, that the existing plants be purchased, and improvements made to the limit of the bond issue. The subject is now under consideration and a bond issue will be submitted to the voters of the city in the early fall.

TRANSPORTATION

VALLEJO, CAL.—The San Francisco, Napa & Calistoga Electric Railroad Company is about to change its route in the vicinity of Suscol.

ORANGE, CAL.—The Pacific Electric Railroad Company is preparing to erect a modern depot here, the work to begin soon. It is believed that the company will also extend its line to Tustin.

SAN FRANCISCO, CAL.—H. S. Tuttle has been awarded the contract for installing electrical conductors on the Church street line of the Municipal Railways from Market street and Van Ness avenue to Sixteenth and Church streets.

SAN FRANCISCO, CAL.—After extended negotiations between city officials and the United Railroads a compromise has been reached regarding the use of the poles and span wires of the United Railroads by the city on Market street and Van Ness avenue.

SAN FRANCISCO, CAL.—San Francisco-Oakland Terminal Railways announced that it had deposited funds with the Wells-Fargo Nevada National Bank to pay the coupons due July 2, 1916, on the general consolidated 5 per cent bonds of the Oakland Traction Consolidated Company.

EAGLE ROCK, CAL.—The franchise for right-of-way on West Colorado Boulevard for a single street car track across the south half of the street from the present terminus onto the feed yard property, where a depot is to be erected, has been granted to the Glendale & Montrose Railroad.

LOS ANGELES, CAL.—Application has been made to the board of supervisors for a certain franchise, granting right within three years to construct and for a period of forty years to maintain a single-track electric railroad in a certain portion of Los Angeles County. Sealed bids will be received up to June 25th.

TRANSMISSION

PORTERVILLE, CAL.—The Mt. Whitney Power & Electric Company is contemplating building a plant near Camp Nelson. A wagon road will be built to the site.

BRIGHAM CITY, UTAH.—The Phoenix Construction Company has established headquarters in this city and will begin at once the construction of a new transmission line of the Utah Power & Light Company from Grace, Idaho, to Salt Lake.

VENTURA, CAL.—Surveys are being run for a transmission line of the Southern California Edison Company through this county down the Santa Clara Valley, touching at Saticoy, thence over Sexton Ranch and back of the Fraser property to Santa Barbara.

CROCKETT, CAL.—General Manager G. M. Rolph of the California-Hawaiian Sugar Company has stated that more electrical equipment will be added at the refinery here and that the entire mill will eventually be operated by electricity from the central power plant.

MARSHFIELD, ORE.—Manager A. L. Martin of the Oregon Power Company, states that the construction of the high power line to carry electricity from the Smith mills to supply Coquille and Mrytle Point will begin early in June. The line will cost upwards of $25,000 and take two months to build.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company will construct a frame substation building at First avenue south and Spokane street in the near future, having a motor generator with a 500 kw. capacity to be increased later to 1000 kw. The building and equipment will cost $12,000.

SANTA BARBARA, CAL.—The Santa Barbara Gas & Electric Company has announced the completion of plans to bring hydroelectric power on high tension lines to this city. The cost of construction of the proposed line is estimated at about $200,000. There will be a reducing plant which will fit the current to city needs.

PORTLAND, ORE.—The county commissioners have granted a franchise to the Portland Railway, Light & Power Company to construct and operate a transmission line along the Columbia Highway for a period of 25 years. The company agrees to operate a line of 11,000 voltage in order to supply the demand of prospective consumers along the highway.

NORTH BEND, ORE.—A. L. Martin, manager of the Oregon Power Company, has received instructions from H. M. Byllesby & Company, of Chicago, to proceed with his plans for building a power extension to Coquille. Mr. Martin also received orders to build a system in Eastside where the company recently was given a franchise. The power wire will cost $25,000.

POCATELLO, IDAHO.—Joseph Burns has made a proposition to the city council providing for the installation of an hydroelectric plant with a capacity of 1500 kw., substation and transmission lines and to sell current at the rate of one-half cent per kw.-hr. His plan is for the city to allow him the contract to furnish the city of Pocatello with current and at the end of 20 years he is to turn over the plant to the city at a normal figure. The matter was referred to the highway and light committees.

TELEPHONE AND TELEGRAPH

NOGALES, CAL.—W. F. Neill is moving to establish in the Vaughn-Elgin region, a local telephone line such as that at Soneita and vicinity.

WALLA WALLA, WASH.—The board of county commissioners has granted a 50 year franchise to the Pacific Power & Light Company to construct and operate electric, telephone and telegraph wires along certain county roads in Walla Walla County.

PENDLETON, ORE.—According to Ed. Mable, manager of the Pendleton telephone office, a new toll line will be constructed from here to the Washington state line and the cost will be $9550. This will include the stringing of 7.2 miles of No. 10 iron wire.

SAUSALITO, CAL.—Application has been made to the board of trustees by the Pacific Telephone & Telegraph Company for a franchise to do a general telephone and telegraph business in this city. Sealed bids will be received for the proposed franchise on July 16th.

OXNARD, CAL.—The Oxnard Home Telephone Company will abandon its present location in the A. Levy building. A complete new switchboard, new charging machine and new up-to-date equipment will be installed in the new location and the present plant will be entirely abandoned and dismantled.

SAN LUIS OBISPO, CAL.—Local Manager Manning of the Pacific Telephone & Telegraph Company has been notified that a corporation has made arrangements for improving its system in this city, including an additional line to Avila and installing central office equipment at Atascadero Colony. The sum of $12,170 covers the cost of placing the exchange aerial cable and the replacement of the pole lines. About $1280 will be expended to place one additional circuit together with miscellaneous exchange pole line reconstruction between San Luis and Avila.

LOS ANELES, CAL.—Funds for actual consolidation of the Home and Pacific telephone systems in Los Angeles have been set aside by the directors of the new Southern California Telephone Company, who have voted approximately $750,000 for this work. More than $250,000 of this amount will be required for new switchboards, additional sections to existing boards, trunks and other equipment. About $14,200 will be expended on the long distance system and requirements for private branches on the part of stores and corporations accounts for about $30,000. Appropriations of approximately $250,000 have been made for the circuit on the trunk lines between the various Home and Pacific exchanges.

IRRIGATION

PHOENIX, ARIZ.—The eastern canal beyond Mesa, is to be enlarged to supply water to large tracts outside of the valley irrigation project.

SUSANVILLE, CAL.—The electors of Baxter Creek Irrigation District by almost an unanimous vote decided to bond the district in the sum of $310,000.

WILLOWS, CAL.—A petition has been filed for the formation of the Jacinto Irrigation District and will be taken up by the supervisors at their June session.

LASSEN, CAL.—With the voting of a bond issue of $810,000, the directors of the Baxter Creek Irrigation District are making every effort to rush the project to completion by January 1, 1918.

OROVILLE, CAL.—The Dudley Ranch and Orchard Company owns 700 acres of land in the vicinity of Central House and plans extensive improvements and will put in a fine irrigating system.

VISALIA, CAL.—As the result of a Railroad Commission order lowering power rates in Tulare County, about 500 pumping plants will be started and an immense amount of irrigation will be done.

SACRAMENTO, CAL.—The governor has signed the California Irrigation Act, providing for the co-operation between the state and government in the storage and division of waters for irrigation purposes.

SACRAMENTO, CAL.—State Engineer McClure and his assistant, Major Norboe, have been called to Scott Valley, in Siskiyou County, to examine a proposed irrigation district that will place a large section of valuable agricultural land under more intensive cultivation.

SALEM, ORE.—The contracts for the furnishing and installation of the equipment for the addition to the city auxiliary steam power plant has been awarded to the C. C. Moore Company, Mutual Life Building, on its bid of $219,000. The company will also take bonds in payment.

OROVILLE, CAL.—For the preliminary expense of organizing an irrigation district, containing 30,000 acres and making the necessary preliminary surveys, the landowners in the proposed district have subscribed $2125 and the business men of Oroville $370, making a total of $2500.

REDDING, CAL.—The Anderson Cottonwood irrigation district has voted to sell $575,000 more bonds to complete the system. This district was already bonded for $350,000. Much of the district will be covered with water by July 1, and the entire system will be completed in another year.

BRAWLEY, CAL.—Mark Rose's Laguna Water Company scheme to irrigate east side Mesa is likely to go through. It is expected that the contract will be signed between the interior department and the Laguna Water Company, providing for financing the scheme by sale of stock of the company.

SUSANVILLE, CAL.—Bonds of $310,000 have been voted by the Baxter Creek Irrigation District. This district comprises 8000 acres ten miles from this city. The $310,000 is to be used in constructing canals, acquiring rights of way and water rights. The bonds will bear interest at the rate of 6 per cent per annum.

PORTERVILLE, CAL.—A total of $601,300 was turned over to the officials of the Terra Bella Irrigation District by the Commercial Trust and Savings Bank in Los Angeles, representing the Aronson-Gale Company of that city, who bought the recently issued bonds of the district. The bonds sold at 97 and netted $68,000, the district cashing interest coupons for the difference.

PRESCOTT, ARIZ.—A bedrock dam has been constructed by the Tres Alamos Land & Irrigation Company about 20 miles west of Congress Junction. The dam is built 80 ft. above the surface and will store water to irrigate about 7000 acres of land. Below the dam is a catch basin to catch the overflow and here a dam 50 ft. high will be put in from which electric power will be generated.

AUBURN, CAL.—The newly organized Horne Development Company of Auburn, Placer County, has filed an application with the State Water Commission to appropriate 20 second feet of the waters of Painter Creek and Buckhorn Creek, in Lassen County, for the irrigation of 9055 acres in that vicinity, where the company plans the establishment of a colony of small ranches. The estimated cost of the project is given at $71,000.

LODI, CAL.—A committee of seven land owners has been appointed to form a Wright Irrigation District in the neighborhood of Lafayette to provide a supply of water for irrigators in the section who have heretofore been using the Stockton-Mokelumne Canal Irrigation system. The committee is composed of E. M. Elliott, J. M. Posey, W. S. Watson, Fred Villinger, W. C. Brown, Frank Perrott and Henry Blohm.

SACRAMENTO, CAL.—The proposed Scott Valley Irrigation District of 5558 acres in Siskiyou County, will be reported upon as feasible by the State Department of Engineering. This is the statement of Major Paul M. Norboe, assistant state engineer, following an inspection of the district by himself and State Engineer W. F. McClure. A petition for the formation of the district, it is expected, will be acted upon by the Siskiyou board of supervisors June 4th.

PARADISE, CAL.—Individual contracts, totaling $172,962, for the construction of the greater part of the system of the Paradise irrigation district have been awarded to W. A. Kraner of San Francisco by the directors. The landowners in the district voted bonds for $350,000 for the construction work. Kraner's contracts were awarded on the following basis: Main canal dam to head of pipe system, $11,375; redwood stave and steel banded pipe, 32 miles, $129,962; balancing reservoirs, pumping station, pressure controls, valves and fittings, $31,625.

SACRAMENTO, CAL.—At a meeting of the Sacramento Valley Development Association held in Chico, W. A. Beard, general manager, in a special report, told of the work that the association could do in the matter of increasing production, by helping to extend the area of irrigated lands in the Sacramento Valley. He called attention to the fact that through the efforts of the association, 6000 or 7000 additional acres are to be irrigated this year by the Orland project. He recommended that steps be taken immediately for increasing the irrigated area in 1918, and that a special committee be named for this purpose.

CHICO, CAL.—Among the topics discussed at a recent meeting of the Sacramento Valley Improvement Board was the Iron Canyon project, already surveyed and reported favorably by the United States Reclamation Service and recognized by the federal government, is expected to provide in its full development for the irrigation of approximately 225,000 acres of Sacramento Valley land. A resolution was presented by W. A. Beard to appoint committees in each of the valley counties to study and report on plans to utilize a great deal of water available for irrigation, but now going to waste. It is proposed to evolve some plan to bring a greater area under irrigation for next season.

LODI, CAL.—A Wright irrigation district will be formed in the section around Lafayette, a few miles west of this city, if the plans of the committee are carried out. The committee met here and formed a permanent organization, electing E. M. Elliott president and John Posey, secretary. Representatives of the Stockton-Mokelumne Canal Company promised the new district the first refusal of the present irrigation system, provided they were able to show results in three days. It is the intention to form a district composed of 20,000 acres, and additional acreage can be added later. It will be necessary to raise about $300,000 to purchase the present system and leave a working capital in the hands of the treasurer. With 20,000 acres in the district it will mean a tax of $15 per acre.

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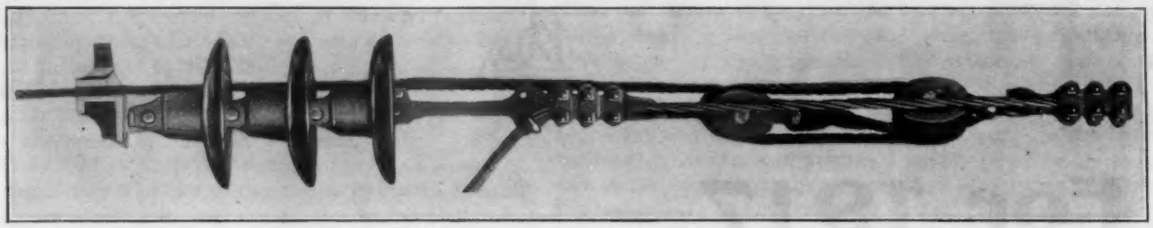


The above illustration shows 3 Victor No. 2335A Units with Victor No. 3032 Strain Clamp

The Anchorage Point in Suspension Insulator Construction

has been greatly strengthened and simplified by the

"VICTOR" Strain Clamp

Hot Dip Galvanized

It is designed to meet the most rigid requirements and fully satisfies all demands as to facility of erection and service rendered.

Distinctive Advantages

1. Permits the loaded cable to ride over seat parallel to span.
2. **Simplicity in erection.** Special eye illustrated at end of clamp permits pulling span to normal position in one operation. When exact deflection or tension is obtained, the conductor is laid in the clamp grove and permanently bolted.
3. Through bolts used instead of J Bolts.
4. No nuts to be removed when placing conductor beneath keeper.
5. All Clamps Right and Left; i. e., a jumper deflecting throat is provided on each side of clamps, so that lineman in erecting can tighten the nuts on clamps from the tower side of span on both spans.
6. Throat not used for jumper, provides exactly the right place for arcing horns of the least expensive type, simply ⅜" or larger steel rods.

A Complete Line of Cable Clamps and other Line Accessories shown in "*The Insulator Book*"

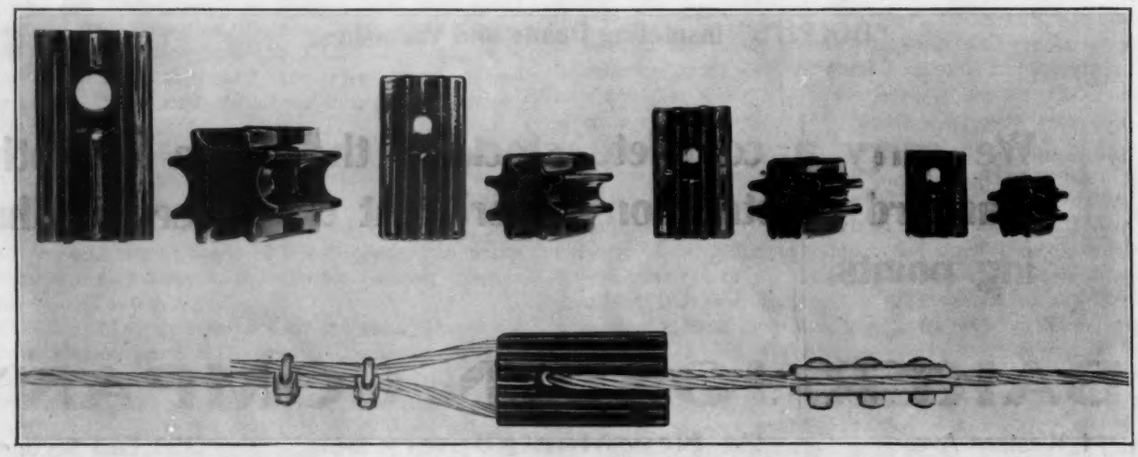
The Locke Insulator Mfg. Co.
Victor, N. Y.

For Canada: The Canadian Porcelain Co., Ltd., Hamilton, Ontario.

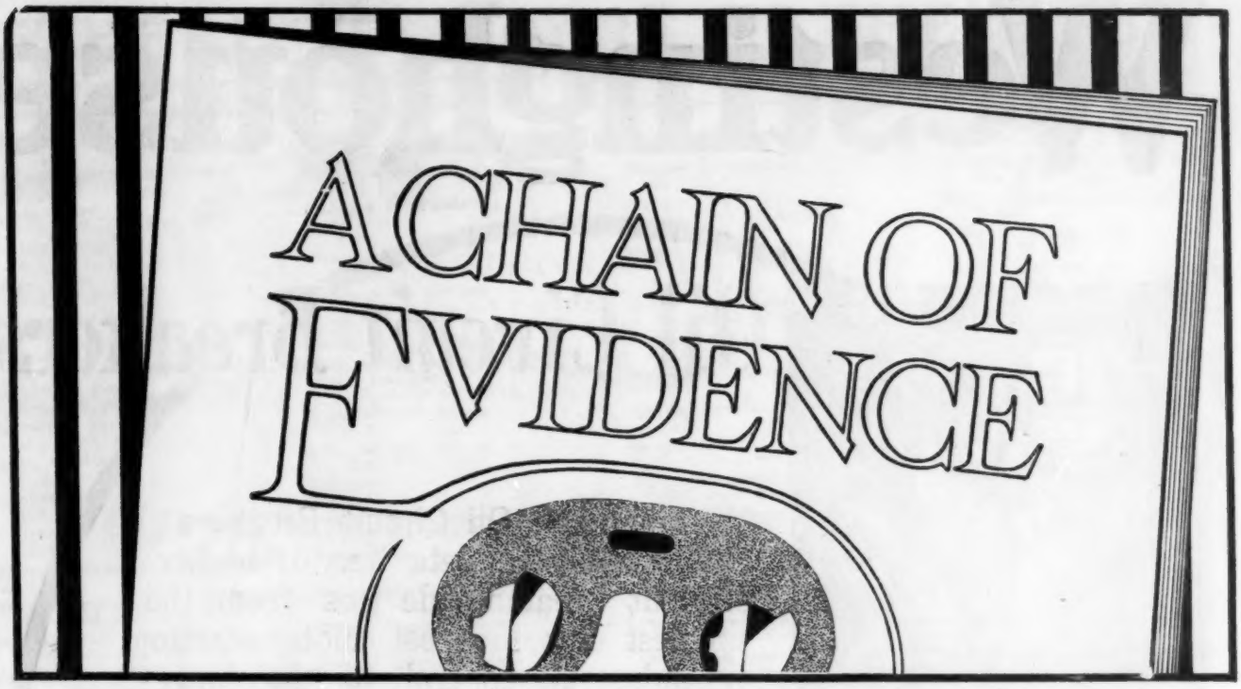
PIERSON, ROEDING & CO.

PACIFIC COAST AGENTS

SAN FRANCISCO SEATTLE LOS ANGELES



Victor Guy Insulators—These designs are used for guying or dead-ending for power and wireless circuits. They are made of wet process, high voltage porcelain and will not puncture either in service or test.



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If you use power at all, you will be interested in our Publication, No. 15

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OUR business has been built up largely on the foundation of service rendered by "small power drives." With 1,500,000 horsepower of Morse "Rocker-Joint" Silent Chains now in use, imagine for a moment the thousands of different applications. They have entered practically every power-using industry, from A to Z, and everywhere have given the same uniform economical service, meeting our own expectations and satisfying our customers.

Get a copy of this bulletin and look around your shop or factory and see where a more quiet drive would be welcome, where a more efficient drive would add considerably to your production, or where a little space could be more advantageously utilized. Then think how well a chain drive,—"Morse, of Course,"—will meet your requirements.

MORSE CHAIN COMPANY, ITHACA, N. Y.

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Please send me a free copy of your new publication, Number 15, A Chain of Evidence, devoted exclusively to "Small Power Drives."

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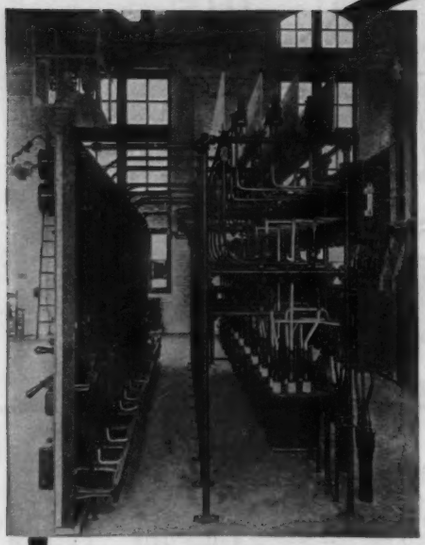
Journal of E. P. & G.—1-1-17

Publication No. 15

Small Power Drives

Westinghouse

Oil Circuit Breakers



300 Amp. 7500 Volt Type F. Breakers in East 11th St. Substation Cleveland Municipal Plant on 2300 Volt Service.

Westinghouse Oil Circuit Breakers embrace a complete line of highly efficient breaking devices from the smallest for low-cost motor-starting or industrial control to the largest ever built by any manufacturer.

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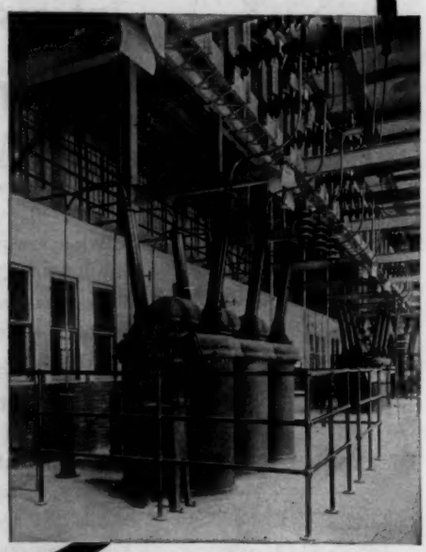
New problems to meet new conditions constantly confront you,—see if we cannot meet them to your benefit with a standard design.



300 Amp. 110,000 Volt Reactance-Type Breakers in generating station of Lehigh Navigation Electric Co., Hauto, Pa. Capacity of Breakers 200,000 Kva. normal generator capacity.

W WESTINGHOUSE ELECTRIC

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EAST PITTSBURGH, PA.

San Francisco, 165 Second St.
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WHERE TO BUY IT IN THE WEST

The letters and numbers in this classified directory refer to the full name and address of advertiser listed on preceding page

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Wireless Apparatus
H-3.

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OF THE WEST

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Engineers an delectrical men wanted to invest in a company manufacturing a new electrical device of great utility and merit. About $25,000 additional capital is required to extend the business. All mechanical development has been done and some of the devices are now in service. It has no competition. Write at once for full particulars. Box 101, Journal of Electricity.

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Will finance properties on a 5 per cent interest bond issue. The single plant owner or the syndicate operator can realize without publicity, as we have a large number of buyers whose combined capital is over one billion dollars. We submit each property to but one purchaser and make no promiscuous offerings. Box 199, Journal of Electricity, Crossley, Bldg., S. F.

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FOR SALE.

Motor for Sale.

1—100 h.p. Westinghouse, Type FX motor; variable speed, 3 phase, 60 cycle, 580 r.p.m., with reversing controller and resistance for continuous operation at reduced speed. In perfect condition. Box 103, Journal of Electricity.

Generator for Sale.

1—25 kw. Westinghouse D.C. 110 volt generator, direct connected to an 8½x10 Ideal, self-oiling, center crank automatic engine. Complete with marble switchboard. This is a chance for a good bargain; has only been used a short time. Write today. Box 105, Journal of Electricity.

Motor for Sale.

1—75 h.p. G. E. motor, 3 phase, 60 cycle, 2200 volt, 900 r.p.m. Ready for immediate shipment. Box 107 Journal of Electricity.

Generator and Motor.

Three Rivers D.C. generator, 15 kw., 230 volt, 65 amp., 1200 r.p.m., including panel board with instruments and complete set of pulleys, jack shaft, etc., ready to set up and put to work. Also one 10 h.p., 220 volt Crocker-Wheeler motor, D.C., 850 r.p.m., complete with starting rheostat; equipment is in fine working order. Make an offer. Only cash will be considered. Box 193, Journal of Electricity.

Gasoline Engines.

2—12 h.p. Fairbanks-Morse gasoline vertical engines, in perfect mechanical condition. Make highest cash offer. Box 191, Journal of Electricity.

POSITION VACANT.

Draftsman, familiar elevator and conveying machinery in crusher plant, in the country; $75-$100 per month. Box 189, Journal of Electricity.

PROPOSALS

EL CENTRO, CALIFORNIA.
December 21, 1916.

SEALED PROPOSALS will be received by the Imperial Irrigation District, at its office, El Centro, California, until ten o'clock A. M., January 12, 1917, and thereupon opened, for the construction of the Rockwood Intake Gate, a reinforced concrete intake structure complete.

The structure is to be approximately 745 feet in length, and 60 feet in width, and consists of a floor with cut off walls supporting a series of piers, which in turn carry a reinforced concrete box which traverses longitudinally the entire structure. The gate is to be erected on the California side of the Colorado River, about 6000 feet up-stream from the Hanlon Headgate of the Imperial Canal, and about 8 miles below Yuma, Arizona, being in Section 25, Township 16 South, Range 21 East, S. B. M., and to be completed on or before May 10, 1917.

Plans, specifications, form of contract, and proposal blanks may be seen at the office of the Board, El Centro, California, and at the office of the Chief Engineer, Calexico, California.

Each bid shall be accompanied by a certified check for TEN THOUSAND ($10,000.00), made payable to the Imperial Irrigation District, as a guarantee that the bidder will, within ten days after acceptance, enter into contract and furnish an acceptable bond in the sum of Seventy five (75) per cent of the sum total of the contract price, based on the District's estimate of the amount of work to be done, for the faithful performance of the work and for the payment of all laborers and material men. The contract will be let to the lowest responsible bidder, but the right is reserved to reject any and all bids.

IMPERIAL IRRIGATION DISTRICT,
By F. H. McIver, Secretary.

In order to bring
Buyer and Seller
together
the
Journal of Electricity
wants to know
what you have
to sell
or
want to buy

Rates on this page are
$1.00 for 25 words,
3 cents per word
additional

MISCELLANEOUS WANTS.

Motors Wanted.

1—75 h.p., 1—100 h.p., 720 or 900 r.p.m., 220 volt, 3 phase, 60 cycle, internal resistance or slip ring type motors. State when delivery can be made. Box 197, Journal of Electricity.

Blue Prints of Motor Windings.

Send $1 for 14 blue prints of motor windings, 10 A.C., single, two and three phase and 4 D.C. or set of 20 A.C., 4 D.C. and 4 rotary converter drawings, $1.60. Windings made easy. Box 195, Journal of Electricity, Crossley Bldg., San Francisco.

Want Ads
in the
Clearing House Section
Bring
Results

POSITIONS WANTED.

Engineer, experienced in oil, coal, gasoline, electricity and ammonia, wants position in electric or ice plant. Box 109, Journal of Electricity.

Draftsman, working at home, wants drawings, tracings, etc., to do. Neat, quick, accurate. Correspondence solicited. Box 155, Journal of Electricity.

Representative, traveling, well acquainted all over West coast, also speaks Spanish fluently, wishes connection with large electrical business house; good references. Box 111, Journal of Electricity.

Electrical and mechanical engineer of electrical construction work, 18 years' experience in all branches. Estimating, superintending and soliciting. Would like to connect with good concern. Box 157, Journal of Electricity.

Executive with a wide and successful commercial and engineering experience in promoting, managing and constructing power properties, is open for engagement. Box 159, Journal of Electricity, San Francisco, 6 Crossley, Bldg.

Chief operator desires position in hydroelectric plant; exceptional experience with Western Power Company; familiar with various types of hydraulic and electrical equipment and capable operator. Only position with opportunity for advancement considered. Strictly temperate. Age 25. Box 153, Journal of Electricity.

American, university graduate, 10 years' experience, proven integrity, energy and originality, business engineering investigations have been a large part of my work for the last 4 years, including power costs, rates, economics, commercial and operating details, extensions, betterments, valuations, special power applications and contracts. Also experience in handling employees, municipal matters, power plant and distribution system, design and construction. Can write or talk to the point. I desire connection with prominent managing, engineering or utility corporation. References given. Employed; changing for good reason. Box 151, Journal of Electricity.

GRIMSHAW

Our Tapes are made of the strongest sheeting obtainable. The compound is rubber, not tar or pitch and it is calendered into, not merely spread on the sheeting. These features are costly but they make tapes that are stronger, stick faster, insulate better, and keep fresh longer than brands without them.

Insulating Tapes

The extra quality is more than worth the extra cost. Increased annual sales for over a quarter century shows others have found it so.

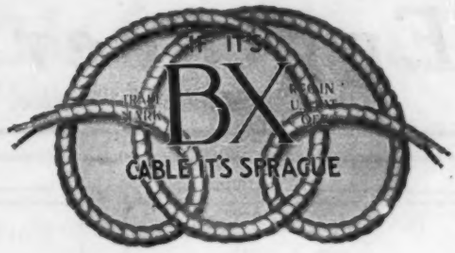
You will too—try these brands the next tape you buy. From your dealer or

New York Insulated Wire Co.

NEW YORK BOSTON CHICAGO

San Francisco
629 Howard Street

COMPETITION



Specify the Original
and
Insure the Quality

Sprague Steel Armored Cables

Hot Galvanized
Extremely Flexible
Adapted to Standard Fittings
Easily stripped at ends

Approved by Underwriters

Write for our new Conduit Bulletin No. J-54

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San Francisco, Rialto Bldg.; Seattle, Colman Bldg.; Los Angeles, Corporation Bldg.; Portland, Electric Bldg.; Spokane, Paulsen Bldg.

"Ironclad-Exide" cell cut away, showing new type of cover, filling plug and splash cover. Also the construction of the positive plate. Note the method of sealing the cover and the lock nuts used to fasten and seal the cover to the cell terminals.

Please Bear In Mind That

The "Ironclad-Exide" Battery

For Electric Vehicles and Industrial Trucks

Is Not the *"Ordinary Lead Battery"*

The "Ironclad-Exide" Battery is entirely different from what you know as the ordinary lead battery—different in the design and construction of the plates and different in the details of assembly.

The positive plate of the "Ironclad-Exide" Battery is made up of a series of hard rubber slotted tubes which contain the active material.

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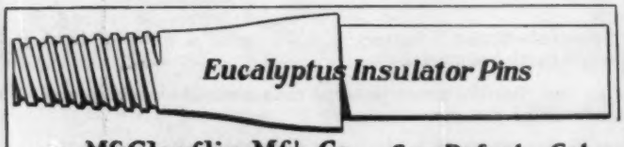

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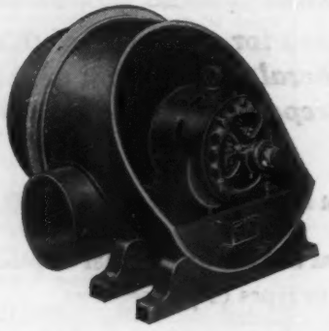

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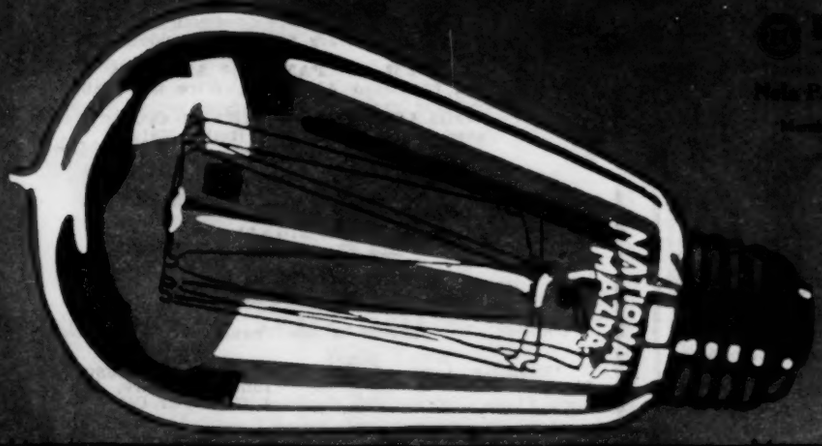

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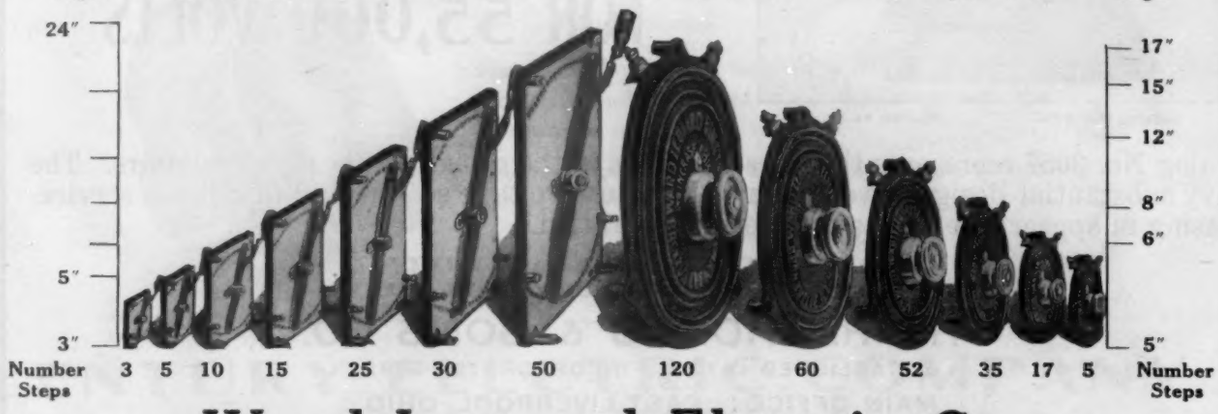

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Power and lighting companies' income per capita	$7.50	$3.00

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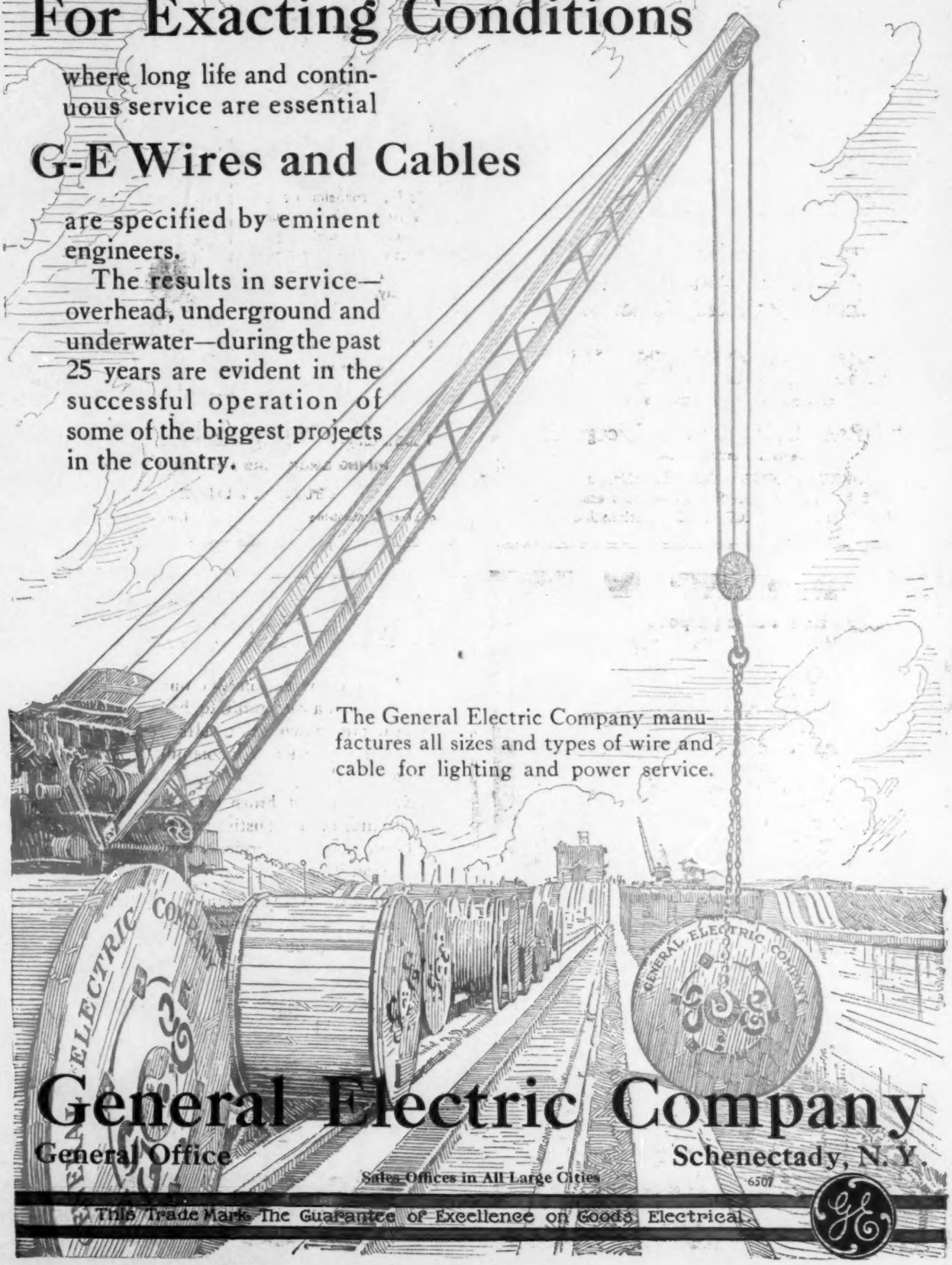

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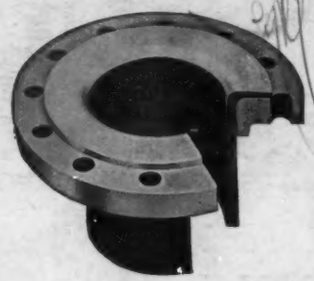

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